

HEALTH AND NUTRITION-RELATED CHARACTERISTICS OF FACULTY AND STAFF  
WHO UTILIZED THE NUTRITION ASSESSMENT LABORATORY AS PART OF THE  
*WORKING WELL* WORKSITE WELLNESS PROGRAM AT BALL STATE UNIVERSITY

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## ABSTRACT

THESIS: Health and Nutrition-Related Characteristics of Faculty and Staff Who Utilized the Nutrition Assessment Laboratory as Part of the *Working Well* Worksite Wellness Program at Ball State University

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The overall state of health in the United States is poor, with a growing incidence of obesity and chronic diseases. The health of employees affects an employer through productivity changes and as health care costs are high for both individuals and employers. For these reasons, it is beneficial for employers to be aware of the health risks of their employees and proactive in prevention and treatment. The purpose of this study was to identify the nutrition and health-related characteristics of faculty and staff at a mid-major university who completed an enrollment survey for the Nutrition Assessment Lab (NAL). The NAL, staffed by an RD or RD-eligible graduate student, offers nutrition education, nutrition counseling, and biometric screening services to Ball State University employees. Results from the Nutrition Assessment Lab Working Well Enrollment Form, collected from 2010-2016, indicated the primary reasons participants came to the lab were to lose weight (65.1%; n=151) and to improve overall diet (56.9%; n=132). The majority of participants were female (81%), white (86.5%), and were classified as professionals (27.2%) or professors (25%). Over two-thirds (67.9%) of the participants were overweight or obese. Measured biochemical data indicated 43.1% had elevated total cholesterol, 65.7% had elevated LDL cholesterol, 30.5% had elevated triglycerides, and

22% had low HDL levels. Results of dietary intake found that only 6.9% of participants reported consuming five or more servings of fruits and vegetables per day. The Stages of Change results indicated the largest percentage of employees who came to the NAL were in the early-action or late-action stage. The results of this study will be used to evaluate the NAL's current services, to justify its continued need, and to improve the services provide by the NAL to better meet the health needs of university employees.

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## **CHAPTER 1**

### **INTRODUCTION**

The overall state of health in the United States is poor, with data from the 2013-2014 National Health and Nutrition Examination Survey (NHANES) indicating more than two-thirds (70.6%) of adults were either overweight or obese (Frayar, Carroll, & Ogden, 2016). According to the National Health Interview Survey, 1999-2000 and 2009-2010, the prevalence of hypertension increased from 35% to 41%, diabetes from 10% to 15%, and cancer from 9% to 11% among those age 45 and older (Freid, Bernstein, & Bush, 2012). During this 10 year period, there was a rise in the prevalence of individuals with multiple chronic diseases, increasing the complexity and cost of care, with 21% of adults aged 45-64 years diagnosed with two or more chronic conditions (Freid et al., 2012).

Strong public health measures, including programs such as worksite wellness, may slow the growth in chronic disease prevalence (Bodenheimer, Chen, & Bennett, 2009). In comparison to usual care, worksite wellness programs are more effective at reducing body fat, body weight, cholesterol levels, and cardiovascular disease risk (van Dongen et al., 2012). Smoking and obesity are associated with increased annual incremental health care costs, defined as the sum of patient and health plan paid amounts (Moriarty et al., 2012). Cardiovascular events and other health risks are associated with increased absenteeism and loss of productivity (Burton et al., 2005; Song et al., 2015). Health care costs are high in the United States and this is a large

expense for employers; corporate health benefits account for nearly 60% of after-tax profits (American Heart Association, 2008). For these reasons, it is beneficial for employers to be aware of the health risks of their employees and proactive in prevention and treatment.

Behavior change is not achieved through education alone. The most appropriate and effective interventions will depend on an individual's stage on the spectrum of behavior change (Prochaska & Velicer, 1997). The Transtheoretical Model of Behavior Change (TTM) (Prochaska et al., 2008; Prochaska, DiClemente, & Norcross, 1992; Prochaska, Redding, & Evers, 2002) conceptualizes the process of intentional behavior change. Included in the model is the concept of "Stages of Change." The Stages of Change model includes five specific stages (i.e., pre-contemplation, contemplation, preparation, action, and maintenance) through which people move as they attempt to make a specific behavior change (Prochaska et al., 2002). Studies have found that people move through these stages when modifying behavior (Glanz et al., 1998). Research indicates that, although the time a person stays in each stage is variable, the tasks required to move to the next stage are not, making the Stages of Change model a useful model to gauge behavior change. Consequently, the model is frequently incorporated into the effective planning of worksite wellness programs (Glanz et al., 1998).

Worksite wellness programs are a cost-effective intervention for improving the health, productivity, and cost-saving to organizations. Primordial and primary prevention are the best ways to protect health (American Heart Association, 2008) as they reduce costs and minimizing disease complications (CDC, 2014a). Preliminary evidence indicates that worksite wellness programs can improve productivity (Cancelliere, Cassidy, Ammendolia, & Côté, 2011).

Understanding the health and nutrition-related characteristics of the target population is crucial to the development and continued improvement of worksite interventions. Additionally, evaluating

the baseline stages of change of the population regarding various health habits will be beneficial for planning outreach and support tools. Thus, determining the current health status of university faculty and staff and identifying the factors that influenced their decision to participate in the Nutrition Assessment Lab services is warranted.

## **Problem**

Health care costs are high in the United States (Tuma, 2012), in part because of the number of individuals with nutrition-related chronic diseases (Freid et al., 2012). Prevention techniques have been shown to reduce costs and minimize disease complications (CDC, 2014a), with the health of Americans of all ages best protected through primordial and primary prevention (American Heart Association, 2008). Strong public health measures, including programs such as worksite wellness, may slow the growth in chronic disease prevalence (Bodenheimer et al., 2009). The Stages of Change model is frequently incorporated into worksite wellness programs as a measure to gauge behavior change (Glanz et al., 1998). Currently little data exists regarding the health and nutrition status of individuals who have obtained services through a Nutrition Assessment Lab at a mid-major Midwestern university. An explanation of the health and nutrition status of the individuals who engage in the Nutrition Assessment Lab will allow the program to be more responsive to the current needs of this population. Thus, determining the current health status of university faculty and staff, and identifying the factors that influenced their decision to participate in the services provided by the Nutrition Assessment Laboratory, is warranted.



## **Purpose**

The purpose of this study is to identify the nutrition and health-related characteristics of faculty and staff at a mid-major university who received services in the Nutrition Assessment Lab, a component of the University's *Working Well* worksite wellness program, between fall semester 2010 and summer semester 2016.

## **Research Questions**

The following research questions, based on data collected from the university faculty, staff and family members who completed the Nutrition Assessment Laboratory Enrollment Form, are examined in this study. The data will be examined both overall and by gender as appropriate.

RQ#1. What are the characteristics of the university faculty, staff and family members who engaged in a university-based Worksite Wellness nutrition program?

- a) Demographic characteristics
- b) Anthropometric measures
- c) Biochemical measures
- d) Clinical measures

RQ#2 What factors are associated with active participation in the Nutrition Assessment Lab?

- a) Health related conditions
- b) Health-related programs desired

RQ#3. What are the health habits and conditions of individuals who receive services at the Nutrition Assessment Laboratory?

RQ#4. What are the nutrition habits of individuals who receive services at the Nutrition Assessment Laboratory?

RQ#5 At what stage in Prochaska's (1992) Stages of Change theory are the Nutrition Assessment Laboratory participants for various health habits?

## **Rationale**

Currently no comprehensive evaluation of the characteristics of the faculty and staff who engage in the Nutrition Assessment Lab (NAL) at a mid-major university has been completed. The chosen research questions reflect the existing questions on the enrollment survey currently used in the NAL. Obtaining and analyzing this data will help with the planning of services and priorities of the NAL. Evaluating the baseline data of the employees is essential for planning effective and relevant interventions. This research will provide valuable insight into the nutrition and health-related characteristics of the target population and will provide the opportunity to improve the services and better the health of university employees who seek services at the Nutrition Assessment Laboratory.

## **Assumptions**

The researcher makes the following assumptions in the implementation of the study and in the interpretation of the data:

1. The faculty and staff completing the enrollment data survey will be truthful in their answers;
2. The faculty and staff will be able to comprehend the survey questions and responses;

3. The enrollment data survey tool will accurately measure health and nutrition-related characteristics;
4. All of the Nutrition Assessment Lab graduate assistants throughout this ten year period followed the protocols for administering the enrollment survey and collecting clinical data;
5. All of the individuals measured were compliant with established protocols;
6. Results of this study can be generalized to any mid-size mid-western university; and
7. The provision of NAL services by a registration-eligible graduate student, hired as the graduate assistant, will not influence the faculty and staff's responses.

## **Definitions**

For the purpose of this study, the following definitions will be used:

1. Worksite wellness: A workplace wellness program is an employment-based activity or employer-sponsored benefit aimed at promoting health-related behaviors (primary prevention or health promotion) and disease management (secondary prevention) (Matke, Schnyer, & Van Busum, 2012) .
2. Primordial prevention: The avoidance adverse risk factors or the prevention of risk factors in the first place, targeted to whole societies or individuals (Lloyd-Jones et al., 2010).
3. Primary prevention: Efforts aimed at individuals who already have adverse levels of known risk factors in order to prevent the occurrence of a clinical event (Lloyd-Jones et al., 2010).

4. Overweight: A body mass index (BMI) of 25 to 29.9 kg/m<sup>2</sup> (Centers for Disease Control and Prevention, 2012).
5. Obesity: A body mass index (BMI) of  $\geq 30$  kg/m<sup>2</sup> (Centers for Disease Control and Prevention, 2012).
4. Absenteeism: An employee's time away from work due to illness or disability (Schultz, Chen, & Edington, 2009)
5. Presenteeism: Reduced on-the-job productivity in employees whose health problems have not necessarily led to absenteeism or the decrease in productivity for the disabled group in the time before and after the absence period (Burton et al., 2005).
6. Transtheoretical model: A model for behavior change that integrates process and principles of change from different intervention theories, including Stages of Change (Prochaska & Velicer, 1997).
7. Stages of Change: A model of behavior change describing a process through a series of six stages: pre-contemplation, contemplation, preparation, action, maintenance, and termination (Prochaska & Velicer, 1997).
8. Registration eligible: Term used by the Commission on Dietetics Registration to identify individuals who have completed an accredited didactic program in dietetics and fulfilled the supervised practice requirements in order to write the registration examination (Commission on Dietetic Registration, 2016).

## **Summary**

The current health status of Americans has worsened over the years with an increasing prevalence of obesity and chronic diseases. The health status of employees affects the rates of absenteeism and presenteeism. Poor employee health is a cost burden on employers, both with

direct and indirect impact. Worksite wellness programs can provide cost-effective interventions and programs to improve the health of the workforce and decrease health care costs.

## **CHAPTER 2**

### **REVIEW OF LITERATURE**

The purpose of this study is to identify the nutrition and health-related characteristics of faculty and staff at a mid-major university who received services in the Nutrition Assessment Lab, a component of the University's *Working Well* worksite wellness program, between fall semester 2010 and summer semester 2016. This chapter reviews the literature related to health care in the United States, behavior change theory, and worksite wellness programs.

#### **Health Care in the United States**

The current health status in the United States is very poor, with many individuals facing chronic diseases. Chronic diseases are the leading causes of preventable death and disability, accounting for 7 out of every 10 deaths in the United States (Xu, Murphy, Kochanek, & Bastian, 2016). Currently, heart disease and cancer, are the two leading causes of death and are accounted for 46.1% of deaths in 2013 (Xu et al., 2016). However, less than one percent of total health care spending is directed toward prevention, while the vast majority (75%) is directed toward treating patients with chronic diseases (Tuma, 2012). Data from the 2012 National Health Interview survey indicates that nearly half of noninstitutionalized adults (i.e., 117 million people) in the United States had at least one chronic condition and one in four have multiple chronic conditions (Ward, Schiller, & Goodman, 2014).

## Current Health Statistics

Obesity, one of the leading chronic diseases in the United States, contributes to the development of other chronic diseases and increased mortalities. Based on the 2012 National Health Interview Survey, 2% of adults aged 18 years and over were underweight, 35% were at a healthy weight, 35% were overweight, and 28% were obese (Adams, Kirzinger, & Martinez, 2013). Compared to the National Health Interview Survey, 2013-14 NHANES results estimated a lower prevalence of overweight, but a higher prevalence of obesity. The NHANES sample adjusts to population totals in order to be nationally representative of the civilian, non-institutionalized U.S. population (Burwell, Frieden, & Rothwell, 2016). Results from 2013-14 NHANES estimated that, among U.S. adults aged 20 and over, 32.7% are overweight, 37.9% are obese, and 7.7% are extremely obese (Frayar et al., 2016). According to 2011-14 NHANES, the prevalence of obesity was higher in women (38.3%) than in men (34.2%) (Ogden, Carroll, Fryar, & Flegal, 2015). Results from the 2015 Behavioral Risk Factor Surveillance System (BRFSS) indicates that, in Indiana, 35.2% of adults are overweight and 31.3% are obese (Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention, & Health Promotion Division of Population Health, 2015).

In addition to obesity, there is a high prevalence of many other chronic diseases in the United States. According to the 2012 National Health Information Survey, 11% of adults aged 18 and over have been told by a health professional that they had heart disease and 24% had been told on two or more visits that they had hypertension (Adams et al., 2013). Data from the 2015 Behavioral Risk Factor Surveillance System (BRFSS) indicated that 5.3% of adults in Indiana have been told they had a heart attack, 5.2% had angina or coronary heart disease, and 3.6% had

a stroke (Centers for Disease Control and Prevention et al., 2015). The self-reported incidence of these conditions in the BRFSS is greater in Indiana than the United States overall (CDC, 2015).

Nearly one-third (30.8%) of adults in the U.S. have hypertension (SBP  $\geq$ 140 mmHg or DBP  $\geq$ 90 mmHg), according to 2013-14 NHANES (Burwell et al., 2016). According to data from the 2009-12 NHANES, 30.3% had elevated LDL-cholesterol (LDL  $\geq$ 130 mg/dL) (Benjamin et al., 2017), with less than half of the adults eligible for cholesterol therapy receiving treatment (CDC, 2011). According to 2011-2014 NHANES, an estimated 12.1% of adults aged 20 and over had high total cholesterol and 18.% had low HDL cholesterol (Carroll, Frayar, & Kit, 2015). Nearly 2,400 Americans die of cardiovascular disease or stroke each day, equivalent to one death every 37 seconds (Rosamond et al., 2008).

According to 2011-12 NHANES, the unadjusted prevalence of diabetes, using hemoglobin A1c, fasting plasma glucose, or 2-hours plasma glucose, was 14.3%, including 9.1% with diagnosed diabetes and 5.2% for undiagnosed diabetes (Menke, Casagrande, Geiss, & Cowie, 2015). The alarming reality is that 38.0% of people with diabetes were undiagnosed (Menke et al., 2015). According to 2012 data from the National Health Interview Survey (NHIS) of adults aged 18 years and older, 9% have been told by a health professional that they had diabetes (Adams et al., 2013). The development of diabetes can be slowed or prolonged if interventions are initiated, particularly in those with pre-diabetes. Based on fasting glucose or hemoglobin A1C levels, 38.0% of adults in the United States had pre-diabetes, in 2011-2012 (Menke et al., 2015). Bullard et al. (2013) reported similar findings, with 36.2% of adults age 18 or older having prediabetes (impaired fasting glucose or elevated hemoglobin A1c levels).

According to data provided by Anthem about Ball State University, 4,008 university current employees and retirees were enrolled in the university health insurance between January



to December 2016. Of these 4,008 employees and retirees, 793 (19.8%) were diagnosed and filling a prescription for hyperlipidemia. Just under one in ten (9.2%; n=370) were diagnosed and filling a prescription for hypertension. In regards to diabetes, 12.7% (n=509) were diagnosed and filling a prescription (Anthem. & Stevens, 2016).

Many leading causes of death are preventable. The American Heart Association (AHA) recognizes that a substantial proportion of cardiovascular events are preventable, although current cardiovascular risk management is inadequate (Gibbons et al., 2008). For instance, nearly 60% of adults with hypertension do not have it controlled and only half of those who are eligible for lipid-lowering treatment are receiving therapy (Gibbons et al., 2008). Of the top five causes of death, an estimated 34% of heart disease, 21% of cancer, 39% of chronic lower respiratory diseases, 33% of cerebrovascular disease, and 39% of unintentional injuries are potentially preventable (CDC, 2014a).

Reducing the number of preventable deaths can be achieved through targeting risk factors, screenings, early interventions, and successful treatment of the disease or condition. The modifiable risk factors related to the top five leading causes of death include, but are not limited to: 1) tobacco use, 2) lack of physical activity, 3) being overweight, 4) sun exposure, 5) alcohol, 6) poor diet, 7) air pollutants, 8) high blood pressure, 9) high blood cholesterol, and 10) diabetes (CDC, 2014a).

The majority of adults in the United States are not meeting recommendations for physical activity (CDC, 2014b). Current federal guidelines recommend adults perform at least 150 minutes a week of moderate-intensity physical activity or 75 minutes a week of vigorous-intensity aerobic physical activity and perform muscle-strengthening activities that involve all major muscle groups on 2 or more days per week (U.S. Department of Health and Human

Services, 2008). According to data from the 2014 National Health Interview Survey, only 49.2% (95% CI, 48.21-50.24) percent of adults met these Physical Activity Guidelines for Americans for aerobic physical activity, with only 20.8% (95% CI, 20.01-21.60) meeting the guidelines for both aerobic and muscle-strengthening activities in 2014 (CDC/NCHS, 2015).

Good nutrition can also lower the risk for many chronic diseases; however, the majority of Americans are falling short of meeting dietary recommendations. Based on the *2015 Dietary Guidelines for Americans*, at the 2,000-calorie level, one should include 2.5 cups of vegetables, 2 cups of fruit, 6 oz. grains, and 3 cups of dairy (U.S. Department of Health and Human Services and U.S. Department of Agriculture, December 2015). NHANES data of 18,000 persons from 2007-2010 indicate that 76% of the entire population had fruit intakes below the minimum recommendation and 87% were below recommended intakes for vegetables, based on USDA food group recommendations by sex-age group (Moore & Thompson, 2015). In a similar analysis of NHANES data, less than 10% of US adults met the AHA recommendation for fruits and vegetables ( $\geq 4$ -5 servings/day) (Rehm, Penalvo, Afshin, & Mozaffarian, 2016). Using data from the 2013 BRFSS, in Indiana, only 11.4% and 7.3% of adults were meeting recommendations for fruit and vegetables, respectively. The NHANES 24-hour recalls also showed that a large majority of the population (86%) exceeded the recommended amounts of energy from solid fats and added sugars (National Cancer Institute, 2015). Nearly 99% of adults did not consume the recommended intake of whole grains and 88% of males and 96.3% of females consumed less than the recommended intake of total dairy products (National Cancer Institute, 2015).

Data from seven consecutive cycles of the NHANES between 1999-2012 indicate that overall diet quality has improved over time (Rehm et al., 2016). Using the American Heart

Association (AHA) summary indicator (i.e., primary dietary components include fruits, vegetables, fish, shellfish, sodium, sugar-sweetened beverages, and whole grains), the primary diet score improved by 11.6%. Based on this AHA score, the estimated proportion of US adults with poor diet quality (<40% adherence to AHA recommendations) decreased from 55.9% to 45.6% ( $p < 0.001$  for trend). Although less than half of the population, it remains a significant percentage. Regarding individual components of the diet score, intakes of sugar-sweetened beverages decreased (-0.49 servings/d; 95% CI, -0.70 to -0.28) and intake of whole grains (0.43 servings/d; 95% CI, 0.34 to 0.53) and nuts, seeds, and legumes increased (0.26 servings/d; 95% CI, 0.18 to 0.34).

Despite the observed improvements, small percentages of the population achieved the recommended levels of most nutrients and food groups (Rehm et al., 2016). The proportion of adults meeting the AHA goals for whole grains ( $\geq 3$  servings per day) and fiber ( $\geq 28$  g/d) is less than 10% (Benjamin et al., 2017). In 2011-2012, the average servings per day of whole fruit was 0.74 (0.68 to 0.81) and vegetables (excluding potatoes and other vegetables) was 1.22 (1.14 to 1.31). Targeting fruit and vegetable intake remains crucial, since no change occurred in the daily intake of total fruits and vegetables nor in the estimated percentage of adults meeting the recommended intake (Rehm et al., 2016). Overall, there are some promising trends the dietary intake of Americans, yet many are not meeting dietary recommendations.

Regular interactions with a primary care physician is one way to assess and modify these risk factors. However, according to the 2014 NHIS, 32.1% of adults have not contacted a doctor or other health care professional within the previous six months and 9.6% of these adults did not having any contact in more than two years (CDC, 2014b). Although prevention and treatment are

effective, there is disconnect between the number of individuals who need it and those who are actively receiving care.

*Healthy People* is a national health promotion and disease prevention initiative aimed at addressing major public health issues (CDC, 2016). This initiative encompasses national, state, and local government agencies as well as other organizations and communities in order to improve the nation's health (CDC, 2016). By establishing benchmarks to monitor progress over time, *Healthy People* aims to encourage collaborations across communities, empower individuals to make informed health decisions, and measure the impact of prevention activities (U.S. Department of Health and Human Services, 2016). Overarching goals of *Healthy People* focuses on preventable disease, disability, injury, and premature death in order to achieve a high quality of life (U.S. Department of Health and Human Services, 2016).

In December 2010, the Department of Health and Human Services released the *Healthy People 2020* report, a national, science-based agenda with 10-year objectives for improving the health of all Americans. This national health agenda includes 42 topic areas ranging from Access to Health Services to Substance Abuse. One purpose of this national program is for other organizations, such as community resources or wellness programs, to align with the same objectives and work together to achieve them. One of the objectives (ECBP-8), under the topic Educational and Community-Based Programs, targets increasing the proportion of worksites with employee health promotion programs (U.S. Dept. of HHS, 2010). In addition, *Healthy People 2020* also includes the objective to increase the proportion of employees who participate in these employer-sponsored health promotion activities (U.S. Dept. of HHS, 2010).

Halfway through the 10-year initiative, the Healthy People 2020 Midcourse Review provides an objective view of the progress toward meeting the targets. Overall, of the measurable

objectives, 40.2% were improving or meeting targets (National Center for Health Statistics, 2016). Of the Educational and Community-Based Programs Objectives, only 7.8% are improving, 15.6% had little or no detectable change, and 18.9% are getting worse. The Midcourse review does not have data available for the objectives specific to worksite health promotion programs. In the Nutrition and Weight Status topic area, 29.0% of the objectives were improving; where as 41.9% had demonstrated little or no detectable change. There were little or no detectable changes in intake of fruits or total vegetables (National Center for Health Statistics, 2016).

#### Cost of Health Conditions on Employees

Poor health and chronic health conditions are very costly for both employees and employers. Employers incur a loss of productivity and indirect costs associated with poor employee health. The poor health of Americans and high incidence of chronic diseases leads to higher health care costs and less productivity, increased absenteeism, and decreased effectiveness at work. Indirect costs to employers include decreased on the job productivity and presenteeism. Absenteeism, short-term disability days, and indirect costs are greater among patients who experienced cardiovascular events and related procedure (CVERP) compared with those without (Song et al., 2015). After the first month of follow-up of individuals with workplace absenteeism and short-term disability benefits, those with CVERP had 56.3 more hours of absenteeism and \$1,119 in additional costs (Song et al., 2015).

The quantity of health risks is associated with additional costs to employers. Burton et al. (2005) incorporated a Work Limitations Questionnaire (WLQ) into a Health Risk Appraisal of 28,375 employees to measure the amount of time at work when an emotional or physical problem interfered with time management, physical work, mental/interpersonal activity, and

output. Results indicated the WLQ score increased progressively according to the number of risk factors present. In addition, the authors found that one's perception of health risks, such as dissatisfaction with life or high stress, had an estimated work loss of 4.5% and 4.1% productivity, respectively. The medium-risk individuals (3 to 4 health risks) reported 6.2% excess productivity loss; the high-risk individuals (5 or more health risks) reported 12.2% excess productivity loss when compared to the low (0-2 health risks) -risk individuals. The authors concluded that the annual cost of lost productivity in the study corporation was estimated between \$1392 and \$2592 per employee.

There are incremental costs associated with poor health conditions. Moriarty et al. (2012) evaluated the 7-year estimates of incremental costs of smoking and obesity among a population of employees and their dependents who had continuous insurance. This study was able to capture costs over the longer-term. Baseline BMI data was obtained from clinical notes rather than self-reported data. Results indicated the annual incremental mean costs, categorized by BMI category, compared with normal BMI to be \$382 for overweight, \$1850 for obese, \$3086 for morbidly obese I, and \$5530 for morbidly obese II, in those less than 65 years. When comorbidities were included, the incremental costs associated with higher BMI classifications compared with a normal BMI remained statistically significant. Obesity was found to be a risk factor for many comorbidities and therefore controlling for comorbidities likely underestimates the true additional costs of obesity. Smoking was also associated with significantly higher costs. The authors concluded that annual incremental costs of smoker were significantly higher (\$1274; 95% CL: \$746 to \$1801) than non-smokers.

Health care is very costly and many employers have to face the burden of high health care costs and providing employee insurance. Nearly 60% of employers' after-tax profits are

spent on corporate health benefits (American Heart Association, 2008). Health spending is expected to grow from 2012-2022, at an average rate of 5.8 percent, which is 1.0 percentage point faster than expected average annual growth in the Gross Domestic Product (Centers for Medicaid & Medicare Services). The cost of chronic diseases and obesity place direct and indirect costs on the employer. This cost occurs directly through employer-provided health care plans and indirectly through higher rates of absenteeism, presenteeism, disability, and injury (American Heart Association, 2008).

### Affordable Care Act

The Patient Protection and Affordable Care Act, passed in 2010, sought to provide insurance for uninsured Americans, improve the affordability for those currently insured, and to ease the growing health care costs (Tuma, 2012). The Affordable Care Act is the largest change in US health policy since the adoption of Medicare and Medicaid in 1965 (Shaw, Asomugha, Conway, & Sein, 2014). One of the major goals of the ACA is bring the security of health insurance to the uninsured. Groups that are at the greatest risk for lacking insurance are young adults, Hispanics, Blacks, and those with low incomes (Blumenthal, Abrams, & Nuzum, 2015).

The ACA shifted the focus toward preventative services and away from the fee-for-service model (Tuma, 2012). Previously, only a small percentage of federal health spending was devoted to public health and prevention and the ACA seeks to place more emphasis toward this strategy. One goal of the ACA is to reduce barriers to preventive services and foster a collaboration between public health and health care. An example of this approach is the establishment of the Million Hearts Initiative in which various methods, such as blood pressure control and decreasing intake of salt, were used to prevent heart attacks (Shaw et al., 2014).

As a result of the ACA's emphasis on prevention, many individuals and families became eligible for preventive services free of charge (Tuma, 2012). The preventative services offered depend on age, but include: blood pressure, diabetes, and cholesterol screenings; cancer screenings; counseling for smoking cessation, weight loss, healthy eating, depression, and alcohol use; regular well-baby and well-child visits; routine vaccines; counseling, screenings, and vaccines during pregnancy; and flu and pneumonia shots (Assistant Secretary for Public Affairs, 2015). Nutrition counseling is a component of preventive services; however the Act does not specifically fund new nutrition programs (Tuma, 2012).

The Affordable Care Act (ACA) has been beneficial for worksites (Anderko et al., 2012). The ACA includes the Prevention and Public Health Fund which provides provisions to address community preventions; clinical prevention; public health infrastructure and training; and research and surveillance focused on workforce wellness (Anderko et al., 2012). Three major prevention provisions in the ACA include waiving cost sharing for preventive services, providing new funding for community preventive services, and creating workplace wellness programs (Anderko et al., 2012). The ACA requires all private health plans to provide the full set of preventive services with no copays or deductibles, however certain plans have grandfathered status (Fox & Shaw, 2015). The enrollment in these grandfathered plans has already decreased, and therefore if more individuals acquire insurance through the Marketplace, a large percentage of the privately insured will have full coverage of preventive services (Fox & Shaw, 2015).

The ACA allows wellness incentives for employees who meet an employer's specified health targets (Tuma, 2012). Effective January 1, 2010 the Act "allowed the US Department of Health and Human Services and Labor to set discounts up to 50% of insurance premiums if the wellness program is determined beneficial for the employee" (Tuma, 2012). By reducing the



number of uninsured individuals and prioritizing preventative services, it was hypothesized that the health of Americans would improve.

A review of the implementation of the first five years of the ACA indicated considerable improvements in the access to affordable health insurance (Blumenthal et al. (2015). An estimated 7 million to 16.4 million uninsured persons have gained coverage since 2010. The ACA has provided states the option to expand their Medicaid programs and, as a result, Medicaid enrollments have grown. The ACA requires all private insurers and employers that offer dependent coverage to cover children until the age of 26, and this has allowed nearly 3 million previously uninsured Americans to gain coverage. The ACA has regulations that prevent insurers from discriminating against persons with preexisting conditions or from terminating policies once persons become ill (Blumenthal et al., 2015). Sommers, Gunja, Finegold, and Musco (2015) found that the Affordable Care Act's first two open enrollment periods were associated with significantly improved trends in self-reported coverage, access to primary care and medications, affordability, and health based on a large national survey. After the second enrollment period ended in 2015, the adjusted changes for being uninsured were -7.9 percentage points from the pre-ACA trend and coverage changes were largest among minorities. (Sommers et al., 2015). Ward, Clarke, Nugent, and Shiller (2016) found that the uninsured rate declined by 43%, from 16% in 2010 to 9.1% in 2015. In addition, the adjusted proportion reporting fair/poor health (decrease of 3.4 percentage points) and days with activities limited by poor health (decreased 1.7 percentage points) showed improvement (Sommers et al., 2015). The survey also indicated increased access to a personal physician and medications.

Several problems have arisen during the implementation of the ACA. A number of companies canceled policies because they did not meet ACA standards (Blumenthal et al., 2015).

Some marketplace plans restrict access to providers by having constrained provider networks (Blumenthal et al., 2015). In addition, results of the 2016 national election may have a significant impact on the ACA as President Trump has vowed to strike the ACA (Evan & Eibner, September 2016).

#### Ball State University Nutrition Assessment Lab

Dietitians can have an effective impact in the health care system. Registered Dietitians (RD) use various health behavior theories to reduce the prevalence of nutrition-related diseases and their complications (Bruening et al., 2015). According to the Academy of Nutrition and Dietetics standards of practice, community dietitians focus on improving the knowledge, behaviors, and skills of individuals and groups in the community-based setting through providing counseling, education, and trainings (Bruening et al., 2015). Registered dietitians contribute to the larger public health efforts of primary prevention of nutrition-related health problems (Bruening et al., 2015) and can work with preventive and wellness services to help employees meet specified health targets, such as weight or cholesterol (Tuma, 2012). Dietitians should focus on demonstrating beneficial and cost-effective patient outcomes (Tuma, 2012).

In January of 2006, Ball State University president Dr. Jo Ann Gora announced a wellness initiative for the university. The aim of the initiative was to encourage better health practices among employees and to continue to provide access to affordable high-quality health care. The plan included incorporating a health assessment tool and then utilizing students, university employees, and outside consultants with expertise in the areas of wellness to improve or manage the health of BSU employees. Drs. Carol Friesen and Alice Spangler, both registered dietitians, served on the university Worksite Wellness committee. In the fall of 2007, the Nutrition Assessment Lab (NAL), initially developed in 2005 by the nutrition faculty in the

Department of Family and Consumer Sciences with funding from a Lilly V Endowment grant, became affiliated with the Working Well Program. For two years, the Department of Family and Consumer Sciences budgeted funds to hire a full-time (20 hours/week) registration-eligible graduate assistant to staff the NAL to provide biometric screenings, nutrition assessment and counseling, nutrition education, and assist with research. Beginning in 2009, the assistantship stipend has been included in the Working Well budget, with the tuition remission supported by the Ball State University Graduate School.

The NAL at Ball State University can fulfill the need for preventive services in a cost-effective manner. The NAL employs a Registered Dietitian (RD) or a RD-eligible graduate student. A worksite nutrition program should consider offering individual nutrition counseling, nutrition education, and various nutrition-related health screening tools. Worksite nutrition programs may affect a large number of employees while providing effective services to the target population (Jensen, 2011).

## **Behavior Change**

The Stages of Change model (Prochaska & Velicer, 1997) is one of the many behavior change theories in use today. In contrast to other theories that represent change as one event in time, the Stages of Change model, also known as the transtheoretical model, explains change as occurring over time.

### Stages of Change Model

There are five stages included in the Stages of Change model (Prochaska & Velicer, 1997). The first stage is pre-contemplation. In the pre-contemplation stage, the person has no intention to take action to change a particular habit within the near future, often measured as the

next six months (Molaison, 2002; Prochaska & Velicer, 1997). Individuals may be in this stage because they are not aware of the consequences of their behavior or the individuals may have made prior attempts to change and were unsuccessful and now feel a sense of defeat (Prochaska & Velicer, 1997). During pre-contemplation, individuals or groups do not talk, read, or even think about their potentially risky behaviors. Some theories categorize these individuals as resistant, unmotivated, or not ready for action (Prochaska & Velicer, 1997). Traditional health promotion programs will not be successful for these individuals.

The second stage in the Stages of Change model is contemplation (Prochaska & Velicer, 1997). During contemplations, there is an intent to change sometime in the near future, typically referred to as within the next six months (Molaison, 2002). Individuals in this stage are aware and evaluating the pros and cons of changing, however they may become stuck in this ambivalence (Molaison, 2002; Prochaska & Velicer, 1997). In the same regards to the pre-contemplation stages, these individuals are not ready for a traditional action-oriented health promotion program (Prochaska & Velicer, 1997).

The third stage in the Stages of Change model is preparation; it is at this point individuals are ready to make a change (Prochaska & Velicer, 1997). Individuals in this stage foresee making the change in the near future, typically referred to as 'within the next month' (Prochaska & Velicer, 1997). Individuals in the preparation stage have begun to anticipate their needs in order to make the change and have a plan of action (Molaison, 2002; Prochaska & Velicer, 1997). The individuals in the preparation stage are the ones whom the action-oriented programs (i.e., smoking cessation, weight loss, or exercise) should target (Prochaska & Velicer, 1997).

Individuals who have reached the action stage have already demonstrated change (Prochaska & Velicer, 1997), having made clear lifestyle changes within the last six months

(Molaison, 2002; Prochaska & Velicer, 1997). It is important to note that not all types of behavior modification is considered to be at the stage of action in the Stages of Change model. A certain criterion of change must be obtained, although it is challenging to determine this point. In an example of dietary changes, Prochaska and Velicer (1997) note that professionals determine action to be a diet with less than 30% of calories from fat. However, this is just one piece of the many factors and choices involved in diet.

The final stage of the Stages of Change Theory is maintenance. The maintenance stage follows the action stage in the model (Prochaska & Velicer, 1997). According to Molaison (2002), the stage of maintenance indicates the change has been maintained for six months (Molaison, 2002). However, Prochaska and Velicer (1997) extend this time frame to five years. Regardless of the duration of the maintenance phase, these individuals are working to prevent relapse and they appear to be more confident in their ability to sustain the change (Molaison, 2002).

Despite the progress through these stages, relapse may occur. Relapse is a form of regression where individuals return to an earlier stage in the model (Prochaska & Velicer, 1997). Unfortunately, relapse is very prevalent around changes in health behaviors (Prochaska & Velicer, 1997). Health promotion programs must be aware of this reality when designing programs and support opportunities.

The last stage in the Stages of Change model is referred to as “termination.” At this point, individuals have no temptation to return to their old, unhealthy habit and possess 100% self-efficacy (Prochaska & Velicer, 1997). For some people, termination may not be realistic and therefore maintenance may be an appropriate end point.

### Progression through the Stages of Change Model

The timing of progression through the stages of changes is not a simple process and will likely vary between individuals (Prochaska & Velicer, 1997). The process of change refers to the explicit or implicit activities which help people to progress through the stages (Prochaska & Velicer, 1997). These activities serve as important guides for intervention programs since these activities help people move from one stage to the next. The ten processes included in change include: consciousness raising, dramatic relief, self-reevaluation, environmental reevaluation, self-liberation, social liberation, counterconditioning, stimulus control, contingency management, and helping relationships (Prochaska and Velicer (1997).

Clinicians can refer to the Stages of Change model as one method to explain a person's behavior as they work with individuals. The first step is for a clinician to estimate the stage of readiness to change (Molaison, 2002). Algorithms have been developed with the purpose to correctly assess a person's stage (Molaison, 2002).

The Stages of Change model can be used to elicit change in individuals and groups. Intervention programs should be tailored toward an individual's stage of change so that it provides information at the appropriate level (Molaison, 2002). In regards to a population and their needs, it is necessary to know the stage distribution of specific high risk behaviors (Prochaska & Velicer, 1997). This distribution will present the percent of the population that is in each of the stages of change. If the stage of readiness is accurately assessed, the clinician is able to provide more appropriate educational material that will meet the client's needs (Molaison, 2002). In turn, the intervention will be more likely to produce long-term outcomes, such as dietary changes (Molaison, 2002).

Assessing an individual's or group's readiness stages will be beneficial in targeting the appropriate population and guiding them through the stages. For example, efforts can be directed toward those who are most ready for action, as not all participants are ready for change (Molaison, 2002). For an individual to progress through the stages, they must determine that the pros outweigh the cons in both number and strength (Prochaska & Velicer, 1997). To assist individuals through the stages, it is beneficial initially to emphasize the pros for the intervention and save the cons until after they reach the contemplation stage. For a program to be successful in recruitment, the program personnel need to reach out and interact with all potential participants, rather than wait for people to contact the program (Prochaska & Velicer, 1997). Programs can use this proactive approach to match individuals to the stage they are in, and therefore increase success rates. Retention is also a challenge with many health promotion programs. Prochaska and Velicer (1997) state that matching the intervention to the stage of change is the best method to support retention.

Intervention strategies and methods vary from stage to stage. In pre-contemplation, the focus is in increased awareness of the need to change (Molaison, 2002). Individualizing the risk of the behavior to that person will show them their susceptibility to future problems (Molaison, 2002). In contemplation, the concentration should be on addressing possible barriers (Molaison, 2002). In moving forward to preparation, the intervention should encourage a switch from thinking about change to actually changing the behavior (Molaison, 2002). At this time, it is also appropriate to discuss the possibility of relapse (Molaison, 2002). The clinician or health educator should suggest lifestyle changes that seem reasonable and easy for the client (Molaison, 2002). In the action stage, discuss strategies to prevent regression. When an individual reaches maintenance, discuss ways to cope with relapse (Molaison, 2002). It is also imperative to help

clients learn how to solve problems and teach them how to ask for help if a problem arises (Molaison, 2002).

### Stages of Change and Worksite Wellness Programs

Worksite wellness programs can have a greater impact if the interventions are based on stages of change. Overall, the goal is to keep individuals in action and maintenance and move them out of the pre-action stages (Molaison, 2002). Those in the action and maintenance stages are more likely to participate in wellness programs. In a large cohort, randomized health promotion trial, Glanz et al. (1998) found a statistically significant ( $p < 0.001$ ) linear trend toward greater participation in nutrition interventions for individuals in later stages of dietary change. The interventions varied greatly, ranging from brochures and videos to contests and taste tests. The most significant difference in participation between stages was evident in comparing the pre-contemplation and contemplation stages. This affirms the belief that individuals in pre-contemplation are unaware of the needs for change and are uninterested in changing their behavior. Glanz et al. (1998) also demonstrated that participants in the intervention compared with the control group had significantly greater odds of being in Action verses Pre-action (OR= 1.45) and in Maintenance verses Pre-action (OR=1.44) at follow-up. However, the intervention did not have an effect on moving to maintenance compared with staying in action. Participants who were in the action and maintenance stages at follow-up demonstrated greater changes in fiber and fruit and vegetable intake. Furthermore, people who reported forward progression among the stages really did change as measured by independent measures of dietary intake. Glanz et al. (1998) conclude that most health behavior strategies appeal to, and are more effective in, individuals with higher levels of readiness to change.



Stages of change can be utilized to measure the effectiveness of wellness programs. Turner, Thomas, Wagner, and Moseley (2008) evaluated a wellness program on stages of change. The participants' stages of change were assessed through two-questions, addressing eating habits and physical activity. Regarding eating behavior, at the beginning of the study 88.3% indicated they were in the action phase or had already changed their eating. By the end of the 12-week program, 86.3% indicated they were in the maintenance phase, indicating many participants moved from action to maintenance. In evaluating the stage of change for exercise, 81.9% indicated they were in the action phase or had already increased their exercise. Following the 12-week program, 56.9% were in the maintenance stage. This free program consisted of a weekly educational and discussion session and a once a month exercise session. This program demonstrated how a short duration program of 12 weeks assisted individuals through the Stages of Change model (Turner et al., 2008).

### **Worksite Wellness Programs**

Worksite health promotion refers to strategies that focus on improving health-related behaviors and health outcomes of workers (Anderson et al., 2009). In light of these goals to improve health, the overarching purpose of worksite wellness programs is to reduce health care costs. The number of Worksite Health Promotion Programs (WHPPs) implemented to reduce costs is expanding (Merrill & Sloan, 2014). Worksite wellness programs are diverse in nature and style through their aim to create a healthy workforce. The worksite can provide an effective and convenient setting to offer wellness programs since employees spend around 50% of their waking hours during the week at the worksite.

Prior to initiating a program, the target population should be determined and evaluated. The program needs to target the type of industry it is serving. The most beneficial attributes of a wellness program will vary depending on the type of company it serves. For instance, a manufacturing company may have different health risks and respond to programs differently than an office-based company (Michaels & Greene, 2013).

Worksite wellness programs offer a variety of programs and interventions. Programs may incorporate incentives, in the form of bonuses and reimbursements, for participation or accomplishment of goals (Baicker, Cutler, & Song, 2010). Health Risk Assessments (HRA) are a widespread tool used to gather health information of employees and deliver wellness programs. This survey gathers baseline, self-reported data from the employee, which is used by the employer to design appropriate wellness interventions (Baicker, 2010). Clinical screenings are often used in combination with health risk assessments to determine clinical risk factors, such as blood pressure, cholesterol, and BMI.

Program interventions target the various components of wellness. Interventions may include: wellness coaching, health coaching, seatbelt safety, oral care, stress management, screen time, physical fitness, educational classes, and nutrition (Aldana, Merrill, Price, Hardy, & Hager, 2005). Worksite nutrition and physical activity programs may occur separately or be included in a larger, comprehensive wellness program (Aldana et al., 2005).

Various models exist to design a worksite program. Anderson et al. (2009) provided a framework for a comprehensive worksite program that incorporates three components: 1) environmental changes and policy, 2) informational messages, and 3) behavioral and social skills or approaches. Worksite environmental changes target the whole population of the workplace through modification of the physical and organizational structure aimed to make healthy choices

the easier option. According to Anderson et al. (2009), environmental changes include increasing access to healthy foods and opportunities to engage in physical activity. Examples include modifying food options in the cafeteria and vending machines and allowing employees access to kitchenettes to prepare and store food from home. The authors suggested that policy strategies may revolve around health insurance benefits or costs, reimbursements, and allotted time for breaks/meals. Information and educational strategies aim toward increasing employees' knowledge about health behaviors and practices. Examples include presentations, educational software, pamphlets, and information on the company intranet. Behavioral and social strategies target self-awareness, self-efficacy, and social support. Interventions may involve behavioral counseling, skill-building activities, and social support systems (Anderson et al., 2009).

Nutrition interventions can have a positive impact on employee health and wellbeing through improving individual dietary habits, altering the food environment, and increasing availability of healthy foods in the workplace. All 30 studies included in a systematic review by Jensen (2011) showed a positive effect of nutritional health promotion elements on employee absenteeism and/or productivity. Weight loss programs, challenges, and support are common nutrition interventions. Worksite wellness programs can provide on-going support for weight loss. Weight loss is a gradual process and weight loss maintenance is just as difficult, if not more difficult. Worksite wellness programs have the potential for long-term contact with employees; consequently, they can offer on-going lifestyle changes and support for those working on weight management (Jensen, 2011).

Wellness centers may be a component of a wellness program. Attendance frequency at a wellness center is associated with lower health care costs. Borah et al. (2015) reported that a frequency of wellness center use of 1 to 60 visits over a 4 year period is associated with

significantly higher mean annual health care costs compared with 61 to 180, 181 to 360, and more than 360 visits ( $p < 0.01$ ). The wellness center described by Borah et al. (2015) offered a variety of services, such as health coaching, fitness, stress management, and educational classes, and therefore it is not possible to distinguish which of these services was associated with the reduction in health care costs.

### Effectiveness of Worksite Wellness Programs

Worksite wellness programs have been effective in improving work ability, weight loss, various health indicators, and health risks. In a meta-analysis of 18 randomized control trials, Rongen, Robroek, Lenthe, and Burdorf (2013) found a significant, yet small effect of workplace health promotion programs ( $ES = 0.24$  (95%  $CI = 0.14, 0.34$ )). The researches included studies involving various interventions. Effects of the worksite health programs were found for self-perceived health ( $ES = 0.23$ , 95%  $CI = 0.13, 0.33$ ); absence due to sickness ( $ES = 0.21$ , 95%  $CI = 0.03, 0.38$ ), productivity at work ( $ES = 0.29$ , 95%  $CI = 0.08, 0.51$ ), and work ability ( $ES = 0.23$ , 95%  $CI = 0.07, 0.52$ ). Workplace health programs had a greater effect in younger population and in interventions with weekly contacts (Rongen et al., 2013).

Anderson et al. (2009) conducted a meta-analysis on worksite program objectives that included lowering weight and BMI. Based on a meta-analysis of nine randomized control trials (RCT's) with a follow up of 6-12 months, a net weight loss of 2.8 pounds (95%  $CI, -4.64, -0.95$ ) occurred following programs aimed at improving nutrition, physical activity, or both (Anderson et al., 2009). In terms of BMI, a net loss of 0.47 BMI (95%  $CI, -1.02, -0.2$ ) was observed in six RCT's with duration of 6-12 months (Anderson et al., 2009).

A meta-analysis by Verweij, Coffeng, van Mechelen, and Proper (2011) included RCTs targeting physical activity and/or dietary behavior of employees but excluded interventions

targeting only overweight subjects, participants with chronic diseases, as well as weight loss programs. Nine studies (n=4514) of workplace interventions that targeted physical activity and dietary behavior provided moderate quality of evidence of a significant reduction in body weight (Mean Difference = -1.19 kg [95% CI -1.64 to -0.74]).

Geaney et al. (2016) found improvements in nutrition knowledge and dietary intake following a combination of nutrition education and environmental dietary modification intervention in a workplace setting. The nutrition education in the intervention was comprised of monthly group nutrition presentations, group nutrition information (monthly posters and emails), and three individual nutrition consultations. Environmental dietary modifications included menu modification, positioning of healthier alternatives, and portion size control. In the combined intervention (education plus environmental changes), there were significant reductions in salt (-1.3 g/day,  $p = 0.010$ ) and BMI (-1.2 kg/m<sup>2</sup>,  $p = 0.047$ ) between baseline and 7-9 months follow-up compared to the control workplace. The combined intervention also resulted in significant reductions in dietary intakes of total fat, saturated fat, and total sugars. Both the combined intervention and the education alone workplace had significant decreases in average weight and significant improvements in nutrition knowledge. Dietary interventions in the workplace, including various nutrition educational channels can be effective in improving dietary intake and weight status (Geaney et al., 2016).

Milani and Lavie (2009) demonstrated positive impacts following a six-month worksite wellness intervention. From a single employer, one worksite served as the control group and the second site (intervention group) received a six-month active intervention. The intervention was provided by a health system and was based on cardiac rehabilitation and exercise training (CRET). The study involved 339 participants, with 185 in the active intervention, which

consisted of health education, referrals to smoking cessation, stress management, lipid clinics, physician referrals, and membership in health and fitness centers. After the intervention, there were significant improvements in scores of quality of life, depression, anxiety, hostility, and somatization (all  $p$  values  $<0.001$ ). At baseline, 26% of the intervention group was classified as high risk, but following the intervention, over half (58%) of this group was converted to the low-risk category. The intervention group also demonstrated significant improvements in HDL cholesterol (+13%,  $p = 0.0001$ ), total cholesterol/HDL cholesterol ratio (-14%,  $p = 0.0001$ ) and total health score (-25%,  $p = 0.0001$ ). Total medical claim costs were measured for 12 months following the intervention. There was a significant decrease in medical claim costs in the intervention group ( $p = 0.0002$ ) and this was significantly different from the control group ( $p = 0.01$ ). This worksite health intervention also displayed financial benefits; for every \$1 dollar invested, \$6 was realized in health care savings. Through utilizing health educators, dietitians, exercise physiologists, psychologists and nurses from CRET services, this intervention was successful in decreasing multiple individual aspects of health.

Merrill and Sloan (2014) describe a one-year worksite health promotion program (WHPP) involving 2,411 employees in a western U.S. school district. The program consisted of four, non-overlapping campaigns of varying length, each providing examples and applicable skills and tools to promote behavior change. These interventions focused on knowledge, self-assessment, physical activity, weight management, and nutrition. In the beginning of the program, participants completed a self-reported Personal Health Assessment (PHA). Over half (52.1%) of the employees enrolled in the program and participated in one or more of the behavior change campaigns. At follow-up after one year, 46% of the participants lowered their BMI, 34.7% lowered their systolic blood pressure, 56.3% lowered their diastolic blood pressure,

65.6% lowered their blood glucose, and 38.6% lowered their total cholesterol. Individuals in the higher-risk groups at baseline were more likely to decrease their baseline scores than individuals in the normal group. Although this study did not include a control group, the researchers conclude that the WHPP was effective at improving the biometric scores of participants.

In nutrition-focused worksite programs, measured outcomes may include changes in weight, dietary intake, or blood chemistry levels. In a systematic review by van Dongen et al. (2012), the two worksite programs with a specific intervention focused on diet resulted in significant weight reductions. These programs were more effective and more costly than usual care at lowering body weight, with an incremental cost effectiveness ratio of \$20 and \$43 per kilogram of body weight loss (van Dongen et al., 2012). Using three studies, Anderson et al. (2009) estimated a range of range of cost-effectiveness from \$1.44 to \$4.16 per pound of loss in body weight. It is difficult, however, to determine how a pound of weight loss translates into a final health outcome (van Dongen et al., 2012)

When comparing the intervention costs to the effect on cholesterol reduction, a nutrition intervention by was more effective than usual care at a cost of \$11 per 1% in cholesterol level reduction (van Dongen et al., 2012). The intervention group in this one study received behavior-based education on dietary changes and improvements in cholesterol were evident at 12 months (Byers et al., 1995). However, there were no set levels for how much different employers are willing to pay for reductions in body weight, cholesterol, and CVD risk, making it difficult to know if the costs associated with achieving these results are acceptable (van Dongen et al., 2012).

Key variables in an effective worksite wellness program need to be identified and evaluated. Frequency of contact and follow-up is one factor influencing effectiveness. Rongen et al. (2013) found, in a meta-analysis, that workplace health promotion programs were more effective when there were at least weekly contacts included. In a systematic review by Anderson et al. (2009), structured programs (i.e., scheduled individual or group counseling) for behavioral skills resulted in greater benefits than unstructured. Participants who are more highly involved may result in better outcomes. Studies evaluating programs in a younger population (<40 years) also tended to be more effective (Masters et al., 2013). Support from leadership positions is a very influential factor in the initiation, participation rate, and long-term success of worksite programs.

Worksite wellness programs aim to reduce both absenteeism and presenteeism, which in turn will save the employee money. Due to an increasingly competitive market, employers are seeking ways to minimize the costs associated with both absenteeism and presenteeism (Merrill & Sloan, 2014). Aldana et al. (2005) collected data on 6,246 employees in a school district in western U.S. and compared costs and absenteeism rates over 2 years between nonparticipants and employees who participated in one of more of the 11 wellness programs offered. Those who participated in the programs had reduced absenteeism, with an average of three fewer missed workdays. Based on this decrease in absenteeism, for every dollar spent on the program, the cost savings was \$15.60. However, there were no significant differences in health care costs between groups.

Worksite wellness programs provide a positive return on investment. Baicker et al. (2010) conducted a meta-analysis with a sample size of 36 studies. The researchers calculated the average return on investment across 15 studies to be 3.37. The savings were calculated as the



difference between treatment and comparison groups after the intervention subtracted by the differences between the groups. The average savings across all programs was \$358 per employee per year, while the cost was \$144 per employee per year.

One challenge worksite wellness programs face is in convincing the employer of their value. The health benefits gained from dietary or other interventions will most likely not occur immediately, but may be expressed down the road, potentially leading the employer to be more cautious because they run the risk of not being able to reap the benefits as some of the employees will get new jobs (Jensen, 2011). There may be a significant gap between health improvements and reductions in medical or productivity-related costs (van Dongen et al., 2012). The economic incentive may appear too weak in the beginning, although it would be favorable in the long-term.

## **Summary**

The current health status of Americans is very poor, with a high incidence of a variety of chronic diseases. Chronic diseases and obesity are leading causes of mortality and many of the top causes of death are preventable. As health care costs continue to rise, the health care system is turning more toward preventative measures. However, preventive measure should evaluate the target population and utilize behavior change models, such as the Stages of Change model, to elicit change. Worksite wellness programs can serve as a cost-effective, preventative tool by improving the health and wellbeing of employees and reducing the burden of health care costs on employers.

## **CHAPTER 3**

### **METHODOLOGY**

The purpose of this study is to identify the nutrition and health-related characteristics of faculty and staff at a mid-major university who received services in the Nutrition Assessment Lab, a component of the University's *Working Well* worksite wellness program, between fall semester 2010 and summer semester 2016. This chapter will describe the methods used to conduct the study.

#### **Institutional Review Board**

Permission was received from Ball State University Institutional Review Board to conduct this research as an exempt study (Appendix A-1). The researcher conducting this analysis completed the Collaborative Institutional Training Initiative training (Appendix A-2).

#### **Subjects**

Subjects in this study included a convenience sample of 266 faculty and staff employed at Ball State University and their family members who completed an enrollment form for the Nutrition Assessment Lab (NAL) between September 2007 and July 2016. The sample included all individuals who: 1) had made an appointment at the NAL, 2) were seen by the NAL Graduate Assistant, and 3) had their data entered into the NAL client enrollment database

between September 2007 when the NAL affiliated with the Working Well Worksite Wellness program and July 2016. For this analysis, only subjects who fully completed the Nutrition Assessment Lab questionnaire (NAL-Q) were included (N=232; 87%).

## **Instruments**

The Nutrition Assessment Lab Enrollment Form (Appendix B-1) was used to collect and document the data. Dr. Carol Friesen, faculty member and supervisor of the NAL, developed the instrument in August of 2007 (Appendix B-2). The form is updated annually, but all variables examined in this study remained consistent throughout the examination period.

All individuals who come to the NAL for any of the available services are asked to complete the Nutrition Assessment Lab Enrollment Form at the beginning of their first appointment. The survey consists of 17 multiple-choice questions divided among three topics: 1) questions about the NAL, 2) health habits and conditions, and 3) nutrition habits. The survey includes questions that address: 1) reasons why the participant came to the NAL, 2) services of interest, 3) current known health conditions, 4) weight changes, 5) smoking and alcohol intake, and 6) daily intake of the main food groups (fruits and vegetables, dairy, and grains). The final section of the survey asked seven questions regarding the individuals' stage of change for various nutrition and health behaviors.

The NAL graduate assistant obtains the biometric screening results during the individual's initial appointment and includes them on the NAL Enrollment Form. Each client's height was measured using a Seca 225 stadiometer. The Seca measurement range is 2-90 inches (6-230 cm) with increments of 1/8 inch (1mm) (Seca, n.d. ). A Tanita Segmental Body Composition Analyzer, model BC-418, measured weight, body mass index, and body fat

percentage (Tanita Corporation). The Tanita uses an 8-electrode, single frequency bioelectrical impedance analysis technique to measure body composition (Tanita Corporation). An *Alere Cholestech LDX Analyzer*, serial number AA 105338, was used to measure and calculate serum total cholesterol, LDL cholesterol, HDL cholesterol, triglycerides, TC: HDL ratio, and blood glucose. The blood samples were placed into Alere Cholestech LDX Lipid Profile/Glucose Cassettes to be analyzed. The Cholestech LDX System is a small, portable analyzer and test cassette system for in vitro diagnostic use only (Cholestech Corporation). The Cholestech is certified by the CDC's Lipid Standardization Program and Cholesterol Reference Method Laboratory Method Network programs (Alere, n.d.). The accuracy and reproducibility of the Cholestech LDX has been evaluated in previous studies (Carey, Markham, Gaffney, Boran, & Maher, 2006; Dale, Jensen, & Krantz, 2008; Plüddemann, Thompson, Price, Wolstenholme, & Heneghan, 2012). Blood pressure was obtained from an Omron Professional Blood Pressure Monitor, model HBP-1300, manufactured by Omron Healthcare, INC.

### **Letter of Consent**

A signed letter of consent was obtained from all individuals who came to the NAL (Appendix C-1). Permission to analyze the 10 years of collected data was received from Rhonda Murr, Director of Working Well (Appendix C-2).

### **Methods**

Every individual who visits the Nutrition Assessment Lab is asked to complete the Enrollment Survey (Appendix B-1) during his or her first visit. The completion of the Enrollment Survey is optional and is not required in order to participate in the NAL services. The

NAL is staffed with a graduate student who is either a registered dietitian (RD) or a RD-eligible candidate who is supervised by a RD who is a faculty member in the Department of Nutrition and Health Science (formerly the Department of Family and Consumer Sciences). A new graduate assistant is hired each year. Each graduate assistant is instructed to explain the Enrollment Survey to each client and offer to answer any of their questions. Participants complete the survey at their own pace. Once completed, the survey is collected by the graduate assistant and the data recorded in a password-protected Microsoft Excel document on a secure server.

All graduate assistants in the NAL perform the biometric screenings and record the results in the appropriate sections on the NAL Enrollment form. All biometric measurements are voluntary; the participant are able to stop the testing at any time if they no longer wish to proceed. All graduate assistants were trained to follow the standard protocol for performing the biometric screening, as outlines in the Working Well Graduate Assistantship Resource Manual (Working Well, 2011).

Height measurements were obtained using a stadiometer with the participant in socks or bare feet. The participants to be measured stands on the platform with his/her back against the measuring rod and with the heels back toward the base of the platform (Seca, n.d. ). The back, scapulae and buttocks were in contact with the vertical board if possible. The participant was instructed to stand straight and look straight ahead. The movable headpiece was pushed onto the head the top of the head with sufficient pressure to compress the hair. Height was recorded to the nearest quarter inch.

Weight measurements were obtained with a Tanita Body Composition Analyzer, model BC-418. Participants were asked to remove heavy jackets or sweaters and any items in his/her

pockets. The power button on the Tanita was pressed to turn it on and 2.0 pounds are entered to compensate for the weight of the clothing. The setting “Standard Female” or Standard Male” is used. The graduate assistant entered the participants’ height (feet, inches), age (years), and body fat percentage goal (if applicable). The participant was asked to step onto the scale with both feet aligned on the metal footplates. Once the Tanita indicated the body weight had been obtained, the participant was instructed to hold onto the handles and place their arms freely by the sides of the body, palms toward thighs.

To obtain a blood pressure measurement, the participant was asked to remove any outer clothing layers if possible. The participants sat in a chair with the feet flat on the floor, resting their lower arm on a table, approximately level with the heart, with the palm open and facing upward. Using the appropriate sized cuff, the graduate assistant fit the cuff on the participant’s upper arm, with the bottom of the cuff 1-2 cm above the elbow. The graduate assistant secured the cuff firmly, but not too tight. The ‘start’ button was pressed to begin the blood pressure reading (Omron, 2003).

Participants were instructed to fast for at least eight hours from food and caffeine prior to the blood lipids/glucose test. The GA performed a finger stick with a lancet and collected about four to five drops of blood, enough to fill a capillary tube. The blood sample was transferred from the capillary tube into the test cassette. The cassette was inserted into the Cholestech to read the results.

## **Data Analysis**

Data from the Enrollment Survey was entered weekly into a password protected Microsoft Excel spreadsheet and saved onto a secure website. If a participant was in the Excel

database more than once (from different visits), only the participant's initial visit was included for analysis. The client's age at the appointment was calculated and rounded to the nearest year. The data was uploaded into and analyzed using SPSS v.24 for Windows (SPSS, 2016). Descriptive statistics and frequency counts were run on all survey questions on the Enrollment Survey and biometric screening results. Frequency counts (number and percent) were used to determine the overall prevalence of each of the specific survey questions. Statistical tests used in the analysis included ANOVA, Chi Square, Independent samples t-test, and crosstabs where appropriate Nominal data (e.g. why the participants came to the lab, what services they are interested in) was analyzed with frequency counts. Statistical significance was set at  $p \leq 0.05$ .

## **Summary**

The nutrition and health status of employees affects the employer both directly and indirectly. The health status of many Americans is poor. Using the Enrollment Survey data from the NAL, the researcher was able to increase knowledge about the specific interests, nutrition risks, and health risks of this population. This will help to better the health of employees at Ball State University through improving the programs and utilization of the Nutrition Assessment Lab.

## **CHAPTER 4**

### **RESULTS**

The purpose of this study is to identify the nutrition and health-related characteristics of faculty and staff at a mid-major university who received services in the Nutrition Assessment Lab, a component of the University's *Working Well* worksite wellness program, between fall semester 2010 and summer semester 2016. This chapter describes the results from this study.

#### **Data Caveats**

Because not every client requested each service offered by the Nutrition Assessment Laboratory, the number of participants will vary throughout the analysis. If a variable was not measured for any given subject, the missing data was treated as 'system missing' in the analysis; no data was imputed. Lastly, it should be noted that the Chi Square assumption of five responses per cell was violated in a few cases due to the relatively low number of male participants. In each instance, the resultant statistic resulted in a non-significant difference by gender.

#### **Subjects**

Participants in this study included all employees and spouses who completed the Nutrition Assessment Lab Enrollment Form, herein referred to as the Nutrition Assessment Lab questionnaire (NAL-Q), between the academic years 2007-08 and 2015-16. Overall, 232 university faculty, staff, and their significant others or family members received services provided by the NAL and completed the majority of questions on the NAL-Q.



### **RQ#1-a: Demographic Characteristics**

By gender, the majority of the 232 respondents were female (81%; n=188 female; 19%; n=44 male) ( $X^2=89.4$ ,  $p < 0.001$ ). The mean age of the NAL clientele was  $44.1 \pm 12.8$  years, with clients ranging in age from 19 to 75 years. By gender, the mean age of the male clients (n=42) was  $42.1 \pm 13.1$  years; the mean age of the female clients (n=183) was  $44.6 \pm 12.8$  years. There was no significant difference in age by gender ( $t=1.143$ ;  $p=0.254$ ).

Overall, the vast majority of participants indicated they were white (86.5%; n=192), followed by black (5.4%; n=12), Asian (3.6%; n=8), Hispanic (3.2%; n=7), and other (1.4%; n=3). By gender, the majority of male participants were white (84.1%; n=37), followed by Asian (7.0%; n=3), black (4.5%; n=2), and Hispanic (2.3%; n=1). The majority of female participants were white (86.6%; n=155), followed by black (5.6%; n=10), Hispanic (3.4%; n=6), Asian (2.8%; n=5), and other (1.7%; n=3). There was no difference in race by gender among the participants ( $X^2=2.58$ ,  $p=0.631$ ).

By job code classification, using the Ball State University job code system, the majority of participants who completed the NAL-Q were classified as professionals (27.2%; n=63), followed by professors (25%; n=58), and staff (24.6%; n=57) (Figure 1). The remaining participants were classified as service (8.2%; n=19), spouses (6.5%; n=15), adjunct or part-time (0.9%; n=2), and unknown (7.8%; n=18) (Figure 1).

By gender, 38.6% (n=17) of the males were classified as 'professionals,' 29.5% (n=13) as 'professors,' 9.1% (n=4) as 'staff,' 6.8% (n=3) as 'service,' and 6.8% (n=3) as 'spouses' (Figure 1). Among females, 28.2% (n=53) were classified as 'staff,' 23.9% (n=45) as 'professors,' 24.5% (n=46) as 'professionals,' 8.5% (n=16) as 'service,' 6.4% (n=12) as 'spouses,' and 1.1%

(n=2) were ‘adjunct or part-time.’ Overall, 9.1% of the males and 7.4% of the females did not have a job classification in the University system and are classified in Figure 1 as ‘unknown.’

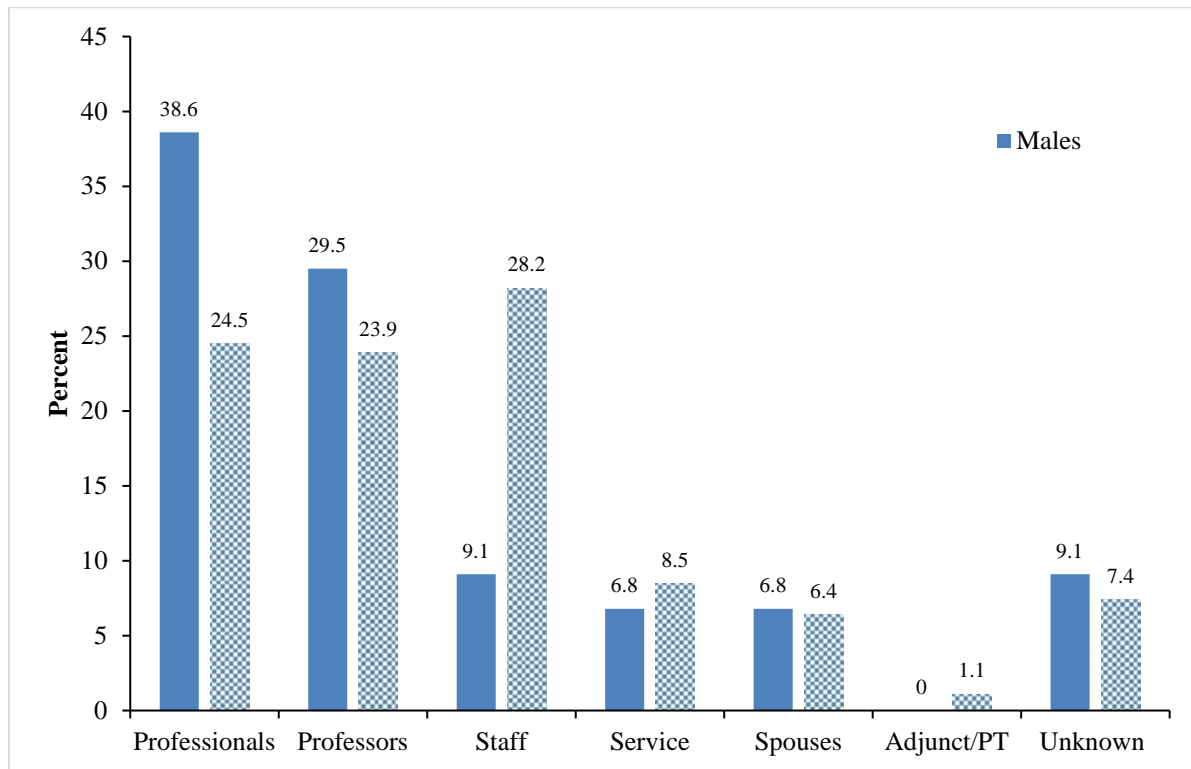


Figure 1. Job Classification of NAL Participants by Gender (N=232)

### RQ#1-b: Anthropometric Measures

Anthropometric tests, including height, weight, and percent body fat, were measured for most clients. Body Mass Index was determined by the Tanita body fat analyzer using the client’s height and weight that were applied to the standard formula of weight in kilograms divided by height in meters squared. All anthropometric values are presented by gender. An Independent samples t-test was used to test the differences in anthropometric data between males and females.

#### Height

Overall, the mean height of participants (n= 166) was 65.7 inches. By gender, men (n=35), on average, were  $70.1 \pm 1.9$  inches, with their height ranging from 66.0 to 74.4 inches.

Women (n=133), on average, were  $64.6 \pm 2.5$  inches tall, with their height ranging from 59.0 to 73.3 inches. Males were significantly taller than females, with a mean difference of 5.5 inches ( $t=12.0$ ;  $p < 0.001$ ) (Table 1).

### Weight

Overall, the mean weight of all participants (n=182) was  $179.1 \pm 46.5$  pounds. By gender, men (n=40), on average, weighed  $203.7 \pm 44.3$  pounds, with their weights ranging from 118.0 to 330.0 pounds. Women (n=142), on average, weighed  $172.1 \pm 44.8$  pounds, with their weights ranging from 83.8 to 310.0 pounds. Males were significantly heavier than females, with a mean difference of 31.6 pounds ( $t=3.94$ ;  $p < 0.001$ ) (Table 1).

### Body Fat

Overall, 157 individuals had their body fat percentage recorded (n=32 male; n=125 female). The mean body fat percentage, overall, was  $33.9 \pm 10.1$ . By gender, men (n=32), on average, had a body fat percentage of  $24.5 \pm 8.1$ , with body fat measurements ranging from 10.5 to 43.1 percent. Women (n=125), on average, had a body fat percentage of  $36.3 \pm 9.1$ , with body fat measurements ranging from 8.4 to 54.5 percent. Females had a significantly higher percent body fat than males ( $t=6.72$ ;  $p < 0.001$ ) (Table 1).

### Body Mass Index

Overall, the mean BMI of all participants (n=182) was  $29.1 \pm 7.1$ . By gender, men (n=40), on average, had a Body Mass Index (BMI) of  $29.1 \pm 6.2$ , with BMI's ranging from 18.5 to 47.4. Women (n=142), on average, had a BMI of  $29.1 \pm 7.4$ , with BMI's ranging from 14.2 to 53.2. There was no difference in BMI by gender ( $t=0.04$ ;  $p = 0.970$ ) (Table 1).

Table 1. Anthropometric Data of Individuals who Completed the NAL-Q by Gender (N=232)

|                         | Gender | n   | Min   | Max   | Mean $\pm$ SD    | t     | p                |
|-------------------------|--------|-----|-------|-------|------------------|-------|------------------|
| Height, inches          | Male   | 35  | 66.0  | 74.4  | 70.1 $\pm$ 1.9   | 12.00 | <b>&lt;0.001</b> |
|                         | Female | 133 | 59.0  | 83.8  | 64.6 $\pm$ 2.5   |       |                  |
| Weight, lbs.            | Male   | 40  | 118.0 | 330.0 | 203.7 $\pm$ 44.3 | 3.94  | <b>&lt;0.001</b> |
|                         | Female | 142 | 73.3  | 310.0 | 172.1 $\pm$ 44.8 |       |                  |
| Body Mass Index (BMI)   | Male   | 40  | 18.5  | 47.4  | 29.1 $\pm$ 6.2   | 0.04  | .970             |
|                         | Female | 142 | 14.2  | 53.2  | 29.1 $\pm$ 7.4   |       |                  |
| Total Body Fat, Percent | Male   | 32  | 10.5  | 43.1  | 24.5 $\pm$ 8.1   | 6.72  | <b>&lt;0.001</b> |
|                         | Female | 125 | 8.4   | 54.5  | 36.3 $\pm$ 9.1   |       |                  |

### BMI Classification

Overall, among the participants for whom a BMI was obtained (n=182), over two-thirds (67.6%; n=123) were classified as overweight (30.7 %; n=56) or obese (36.8%; n=67), including 37 participants (20.3%) who were classified as Obese 1 and 30 (16.5%) who were classified as Obese 2. Nearly one-third (30.2%; n=55) of the participants had a BMI classified as normal. Slightly more than 2 percent (2.2%; n=4) had a BMI that was classified as underweight (Figure 2).

Among males (n=40), almost three-quarters (72.5%; n=29) were classified as overweight (37.5%; n=15) or obese (35%; n=14), with 10 (25%) of the obese males classified as Obese 1 and 4 (10%) classified as Obese 2. Slightly more than one-quarter (27.5%; n=11) of the male participants had a BMI that was classified as normal. No male had a BMI classified as underweight (Figure 2).

Among females (n=142), almost two-thirds (66.2%; n=94) were classified as overweight (28.9%; n=41) or obese (37.3%; n=53), with 27 (19.0%) of the females classified as Obese 1 and 26 (18.3%) classified as Obese 2. Nearly one-third (31.0%; n=44) of participants had a BMI that was classified as normal. Four women (2.8%) had a BMI that classified them as underweight

(Figure 2). There was no significant difference in BMI classification by gender ( $X^2 = 9.299$ ;  $p = 0.098$ ).

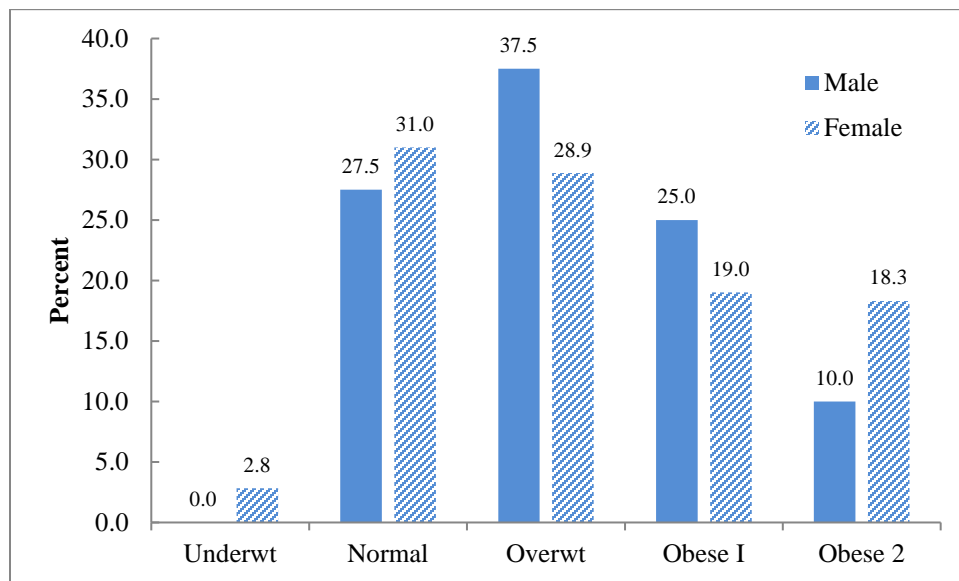


Figure 2. Percent of Participants by BMI Classification and Gender (n=182)

### RQ#1-c: Biochemical Measures

Biochemical tests included: 1) total cholesterol; 2) LDL cholesterol; 3) HDL cholesterol; 4) total cholesterol to HDL cholesterol ratio; 5) triglycerides; and 6) blood glucose. All indices, measured by the Alere Cholestech, will be presented both overall and by gender. An Independent samples t-test was used to detect differences in mean by gender and a chi-square was used to test differences in classifications by gender.

#### Total Cholesterol

Overall, cholesterol measures were obtained from 102 participants (21 males; 81 females). The mean total cholesterol was  $194.8 \pm 42.1$  mg/dL, with a range of 101-331 mg/dL (Table 2).

Table 2. Biochemical Measures of NAL Participants Overall (N=232)

| Measure                   | n   | Mean $\pm$ SD    | Target*    | Range   |
|---------------------------|-----|------------------|------------|---------|
| Total Cholesterol (mg/dL) | 102 | 194.8 $\pm$ 42.1 | <200       | 101-331 |
| HDL (mg/dL)               | 100 | 51.5 $\pm$ 16.4  | $\geq$ 60  | 24-98   |
| LDL (mg/dL)               | 88  | 119.6 $\pm$ 37.5 | <100       | 36-208  |
| Triglycerides (mg/dL)     | 95  | 144.2 $\pm$ 98.6 | <150       | 45-547  |
| TC/HDL Ratio              | 42  | 4.6 $\pm$ 1.4    | $\leq$ 3.5 | 2-802   |
| Blood Glucose (mg/dL)     | 94  | 90.5 $\pm$ 12.7  | <100       | 61-146  |

\*Target values based on current American Heart Association Guidelines

By gender, men (n=21) had a mean total cholesterol of 196.1  $\pm$  38.5 mg/dL, with a range of 135 to 270 mg/dL. Women (n=81) had a mean total cholesterol of 194.5  $\pm$  43.2 mg/dL, with a range of 101 to 331 mg/dL. There was no difference in total cholesterol by gender (t=0.15; p=0.878) (Table 3).

Table 3. Comparison of Biochemical Data between Males and Females (N=232)

|                             | Gender | n  | Mean $\pm$ SD     | t    | p            |
|-----------------------------|--------|----|-------------------|------|--------------|
| Total Cholesterol, mg/dL    | Male   | 21 | 196.1 $\pm$ 38.5  | 0.15 | 0.878        |
|                             | Female | 81 | 194.5 $\pm$ 43.2  |      |              |
| LDL Cholesterol, mg/dL      | Male   | 19 | 134.8 $\pm$ 34.2  | 2.03 | <b>0.045</b> |
|                             | Female | 69 | 115.4 $\pm$ 37.5  |      |              |
| HDL Cholesterol, mg/dL      | Male   | 19 | 42.8 $\pm$ 10.4   | 3.53 | <b>0.001</b> |
|                             | Female | 81 | 53.5 $\pm$ 16.9   |      |              |
| Total Cholesterol/HDL Ratio | Male   | 12 | 4.8 $\pm$ 1.2     | 0.57 | 0.572        |
|                             | Female | 30 | 4.5 $\pm$ 1.5     |      |              |
| Triglycerides               | Male   | 20 | 125.2 $\pm$ 59.1  | 1.34 | 0.186        |
|                             | Female | 75 | 149.3 $\pm$ 106.5 |      |              |
| Blood Glucose               | Male   | 20 | 95.4 $\pm$ 10.7   | 1.95 | 0.054        |
|                             | Female | 74 | 89.2 $\pm$ 13.0   |      |              |

Overall, the cholesterol levels of more than half (57%; n=58) of the clients were classified as ‘desirable’ (less than 200 mg/dL), slightly more than one-quarter (28.4%; n=29) were classified as ‘borderline high’ (200-239 mg/dL), and 14.7% were classified as ‘high’ (240 m g/dL or higher).

By gender, more than one-half of the men had desirable cholesterol (52.4%; n=11), one-third (33.3%; n=7) had borderline high cholesterol (200-239 mg/dL), and 14.3% (n=3) had high cholesterol levels ( $\geq 240$  mg/dL) (Figure 3). Slightly more than one-half (52.4%; n=11) of the male participants had normal cholesterol levels (<200 mg/dL) (Figure 3; Table 4). Among women, more than half had desirable cholesterol (58.0%; n=47), slightly more than one-quarter (27.2%; n=22) were classified as having borderline high cholesterol (200-239 mg/dL), and 14.8% (n=12) had high cholesterol ( $\geq 240$  mg/dL) levels (Figure 3). There was no difference in the lipid classification distribution by gender ( $X^2 = 0.320$ ;  $p = 0.852$ ) (Table 4).

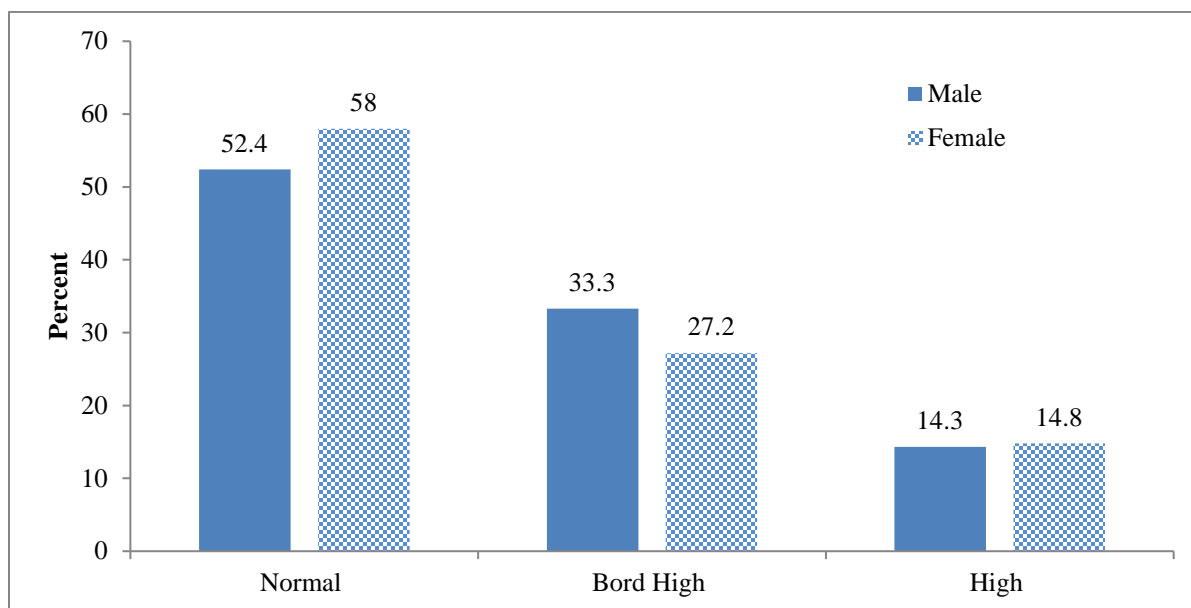


Figure 3. Percent of Participants by Total Cholesterol Classification and Gender Among Those for Whom Total Cholesterol was Obtained (n=102)

Table 4. Participants Lipid Classification both Overall and by Gender

| Variable                    | Overall<br>N | Category<br>N | Males<br>N | Females<br>N | X <sup>2</sup> | p     |
|-----------------------------|--------------|---------------|------------|--------------|----------------|-------|
| Total Cholesterol, mg/dL    | 102          |               |            |              |                |       |
| Desirable <200              |              | 58            | 11         | 47           | 0.320          | 0.852 |
| Borderline High 200-239     |              | 29            | 7          | 22           |                |       |
| High ≥240                   |              | 15            | 3          | 12           |                |       |
| LDL-Cholesterol, mg/dL      | 88           |               |            |              |                |       |
| Optimal <100                |              | 31            | 4          | 27           | 5.23           | 0.318 |
| Near Optimal 100-129        |              | 18            | 4          | 14           |                |       |
| Borderline High 130-159     |              | 27            | 6          | 21           |                |       |
| High 160-189                |              | 8             | 4          | 4            |                |       |
| Very High ≥190              |              | 4             | 1          | 3            |                |       |
| HDL-Cholesterol, mg/dL      |              |               |            |              |                |       |
| High ≥60                    | 100          | 29            | 2          | 27           | 5.17           | 0.075 |
| Normal 40-59                |              | 49            | 10         | 39           |                |       |
| Low <40                     |              | 22            | 7          | 15           |                |       |
| Total Cholesterol/HDL Ratio | 42           |               |            |              |                |       |
| Optimal ≤3.5                |              | 8             | 2          | 6            | 0.06           | 0.804 |
| High (> 3.5)                |              | 34            | 10         | 24           |                |       |
| Triglycerides, mg/dL        | 95           |               |            |              |                |       |
| Optimal <150                |              | 66            | 16         | 50           | 1.82           | 0.609 |
| Borderline 150-199          |              | 10            | 2          | 8            |                |       |
| High 200-499                |              | 17            | 2          | 15           |                |       |
| Very High ≥500              |              | 2             | 0          | 2            |                |       |
| Blood Glucose, mg/dL        | 94           |               |            |              |                |       |
| Optimal <100                |              | 76            | 14         | 62           | 2.65           | 0.268 |
| Impaired ≥100 to <126       |              | 17            | 6          | 11           |                |       |
| Diabetes ≥126               |              | 1             | 0          | 1            |                |       |

Of the 15 participants with high total cholesterol levels, one-third (n=5; 33.3%) either did not mark or did not know they had high levels when asked to indicate, “My health conditions are” from a list of options in the NAL questionnaire. Of these, two (40%) were male and 3 (60%) were female. There was no difference in the percent of participants who had high cholesterol levels – but did not know it – by gender ( $X^2=1.877$ ;  $p=0.171$ ).



## HDL Cholesterol

Overall (n=100), HDL cholesterol levels ranged from 24-98 mg/dL, with a mean of  $51.5 \pm 16.4$  mg/dL (Table 2). Slightly more than one-quarter (29.0%; n=29) of the participants had HDL cholesterol levels greater than the target of 60 mg/dL, while 49.0% (n=49) had HDL levels in the normal category (HDL 40-59 mg/dL) (Table 4). Nearly one-quarter of participants (22%; n=22) had low HDL cholesterol (< 40 mg/dL).

By gender, men (n=19) had a mean HDL of  $42.8 \pm 10.4$  mg/dL, ranging from 24.0 to 64.0 mg/dL. Women (n=81) had a mean HDL of  $53.5 \pm 16.9$  mg/dL, ranging from 24.0 to 98.0 mg/dL (Table 3). Females had significantly higher HDL levels than males, with a mean difference of 10.7 mg/dL ( $t=3.53$ ;  $p=0.001$ ).

By lipid classification, over half of the males had normal HDL cholesterol (52.6%; n=10) and over one-third (36.8%; n=7) had low HDL levels. Only 10.5% (n=2) had high (healthy) HDL cholesterol. Among females, almost half (48.1%; n=39) had normal HDL and 18.5% (n=15) had low HDL levels. Approximately one-third (33.3%; n=27) had high (healthy) HDL cholesterol levels (Figure 4.). Significantly more women had a “high” or “healthy” HDL level compared to men ( $X^2=11.78$ ,  $p=0.003$ ).

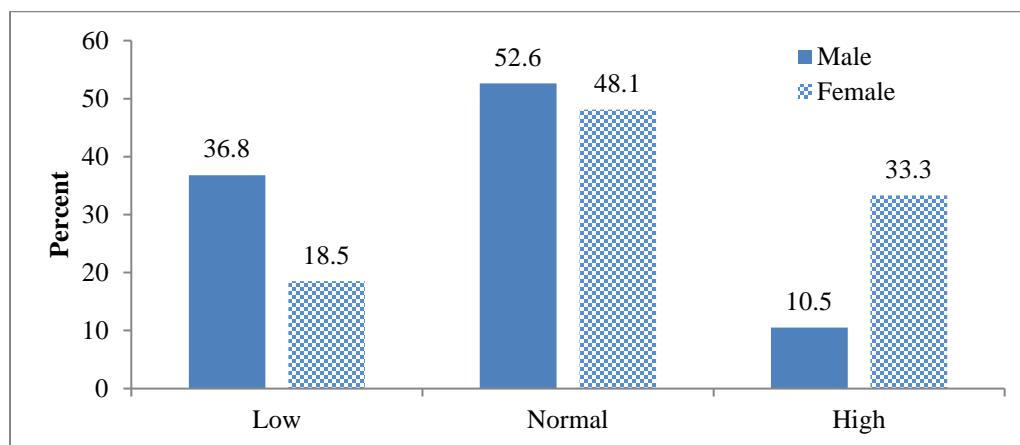


Figure 4. HDL Classification by Gender (n=100)

## LDL Cholesterol

The mean LDL cholesterol level among participants (n=88) was  $119.6 \pm 37.5$  mg/dL, with a range of 36-208 mg/dL (Table 2). Only one-third (35.2%; n=31) of participants had optimal LDL cholesterol levels (<100 mg/dL) (Table 4). More than one in five (20.4%) had near optimal, 30.7% had borderline high, 9.1% had high, and 4.5% had very high LDL (Table 4).

Among males (n=19), the mean LDL cholesterol was  $134.8 \pm 34.2$  mg/dL, ranging from 83 to 201. Among females (n=69), the mean LDL cholesterol was  $115.4 \pm 37.5$  mg/dL, ranging from 36 to 208 mg/dL. Males had a significantly higher LDL cholesterol level (t=2.03; p=0.045) than females (Table 3).

By classification, 21.1% of males (n=4) had optimal LDL cholesterol, 21.1% (n=4) had near optimal LDL levels, 31.6% (n=6) had borderline high LDL levels, 21.1% (n=4) had high LDL levels, and 5.3% (n=1) had a very high LDL cholesterol level. Among females, 39.1% (n=27) had optimal cholesterol levels, 20.3% (n=14) had near optimal LDL levels, 30.4% (n=21) had borderline high LDL levels, 5.8% (n=4) had high LDL levels, and 4.3% (n=3) had very high LDL cholesterol levels (Figure 5). There was no difference in the distribution of LDL cholesterol levels between men and women ( $X^2=5.234$ , p = 0.264).

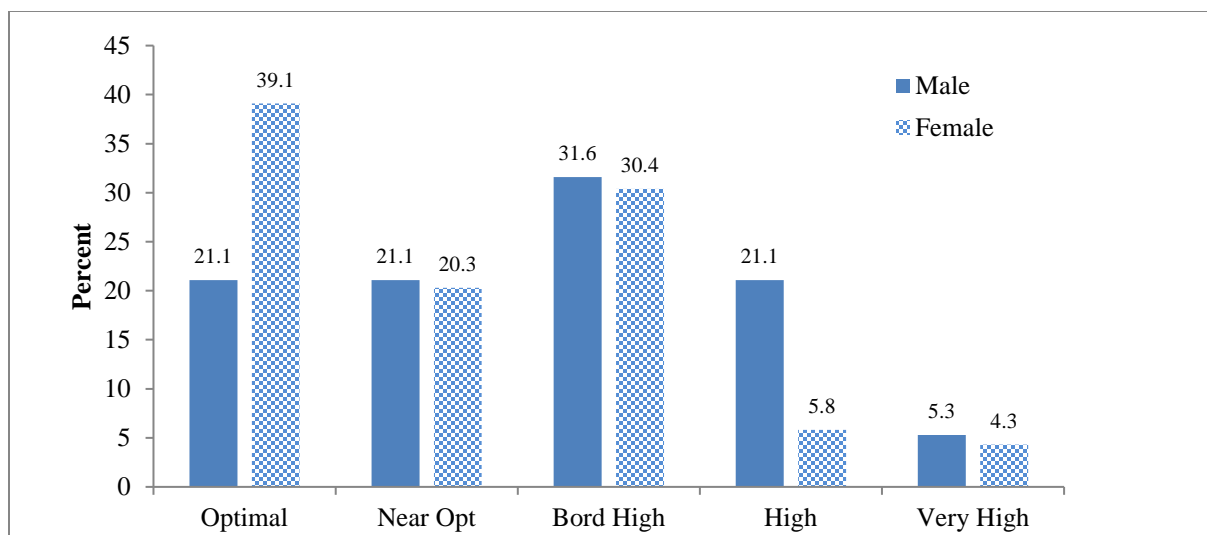


Figure 5. Classification of LDL Cholesterol Levels by Gender (n=88)

### Triglycerides

The mean triglyceride level among those with measured levels (n=95) was  $144.2 \pm 98.6$  mg/dL, with a range of 45-547 mg/dL (Table 2). Over two-thirds (69.5%) of the participants had optimal triglycerides (<150 mg/dL) (Table 4).

By gender, men (n=20), on average, had triglycerides levels of  $125.2 \pm 59.1$  mg/dL, ranging from 63 to 288 mg/dL. Women (n=75), on average, had triglyceride levels of  $149.3 \pm 106.5$  mg/dL, ranging from 45 to 547 mg/dL. There was no difference in triglycerides by gender ( $t=1.34$ ;  $p=0.186$ ) (Table 3).

By classification, 80% (n=16) of the 20 men had optimal triglyceride levels, 10% (n=2) had borderline high triglycerides, and 10% (n=2) had high triglyceride levels. No males had a triglyceride level classified as “very high.” Among females, 66.7% (n=50) had optimal triglycerides, while 10.7% (n=8) had borderline high, 20.0% (n=15) had high triglycerides, and 2.7% (n=2) had very high triglyceride levels (Figure 6) (Table 4). There was no difference in the classification of triglyceride levels between men and women ( $X^2=1.826$ ,  $p=0.609$ ).

Of the 19 participants who had high (n=2 male; n=15 female) or very high (n=2 females) triglyceride levels, 14 (74%) (1 male; 13 females) either did not mark or did not know they had high triglyceride levels when asked to indicate, “My health conditions are” from a list of options in the NAL questionnaire. There was a significant difference in the percent of participants who had high triglyceride levels – but did not know it – by gender ( $X^2=4.26$ ;  $p=0.039$ ).

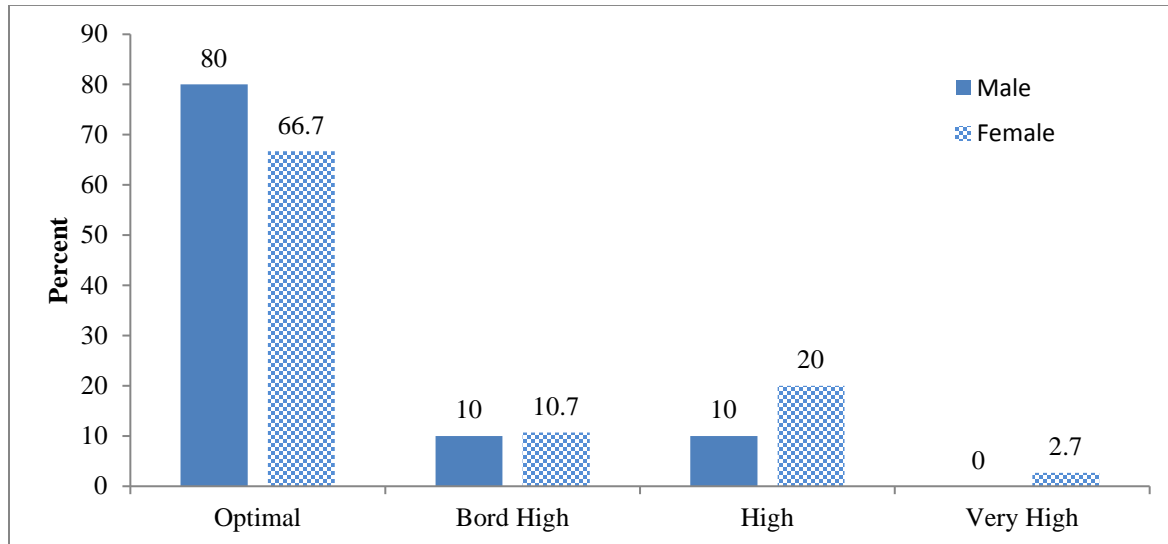


Figure 6. Classification of Triglyceride by Gender (n=95)

#### Total Cholesterol/HDL Cholesterol Ratio

Overall, among the participants for whom a TC/HDL ratio was recorded (n=42), the mean ratio was  $4.6 \pm 1.4$ , with a range from 2.0 to 8.2 (Table 2). Only 19% (n=8) had an optimal TC/HDL ratio of  $\leq 3.5$  (Table 4).

By gender, the TC/HDL ratio for males (n=12) was  $4.8 \pm 1.2$ , with a range of 2.7 to 6.7 (Table 3). Only 16.7% (n=2) of males had an optimal TC/HDL ratio. Among females (n=30), the average TC/HDL ratio was  $4.5 \pm 1.5$ , with a range of 2.0 to 8.2. Only 20% (n=6) of women had an optimal TC/HDL ratio. There was no significant difference in the TC/HDL ratio by gender ( $t=0.57$ ;  $p=0.572$ ).

## Blood Glucose

The mean blood glucose level among those with recorded values (n=94) was  $90.5 \pm 12.7$  mg/dL, with a range of 61-146 mg/dL (Table 2). The majority of participants (80.9%; n=76) had a blood glucose level within the optimal range (<100 mg/dL) (Table 4). Seventeen participants (18.1%) had impaired blood glucose ( $\geq 100$  to <126), while only one (1.1%) participant was in the range of diabetes ( $\geq 126$  mg/dL) (Table 4).

By gender, the mean blood glucose among males (n=20) was  $95.4 \pm 10.7$  mg/dL, ranging from 77 to 118 mg/dL. Among females (n=74), the mean blood glucose was  $89.2 \pm 13.0$  mg/dL, ranging from 61 to 146. There was no difference in blood glucose levels by gender (t=1.95; p =0.054) (Table 3). By health risk classification, among males, 70% (n=14) had optimal fasting glucose levels and 30% (n=6) had impaired fasting glucose levels (Figure 7) (Table 4). Among females, 83.8% (n=62) had optimal glucose, while 14.9% (n=11) had impaired and 1.4% (n=1) had high glucose levels (Figure 7) (Table 4). There was no significance in the blood glucose classification by gender ( $X^2=2.65$ ; p = 0.268). Fourteen of the 17 (82%) participants with impaired fasting glucose either did not know or did not indicate they had pre-diabetes or diabetes on the NAL-Q.

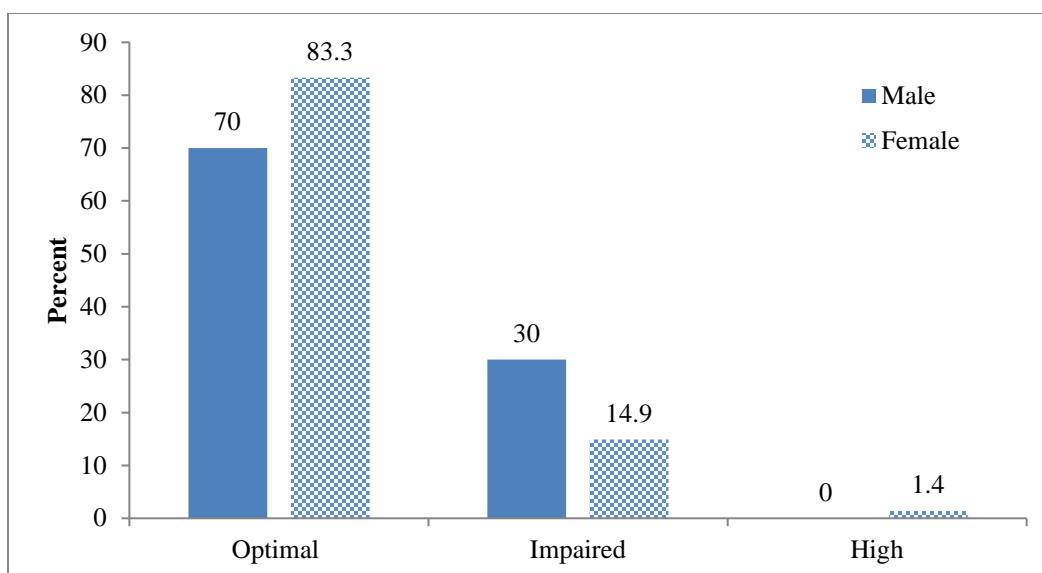


Figure 7. Classification of Fasting Blood Glucose by Gender (n=94)

#### **RQ#1-d: Clinical Measures**

Clinical measures taken included systolic blood pressure, diastolic blood pressure, T-score, and Z-score. All clinical values are presented overall and by gender. An Independent samples t-test was used to test the differences in clinical measures between males and females.

#### Systolic Blood Pressure

Among all participants with recorded blood pressure (n=85), mean systolic blood pressure (SBP) was  $122.1 \pm 15.4$  mmHg, ranging from 92 to 169 mmHg (Table 5). Nearly half (49.4%; n=42) of all participants had SPB less than or equal to 120 mmHg (Table 6).

Table 5 Overall Clinical Data of NAL participants

| Measure                         | n  | Mean $\pm$ SD    | Target                 | Range  |
|---------------------------------|----|------------------|------------------------|--------|
| Systolic Blood Pressure (mmHg)  | 85 | 122.1 $\pm$ 15.4 | < 120 mmHg*            | 92-169 |
| Diastolic Blood Pressure (mmHg) | 86 | 75.2 $\pm$ 11.1  | $\leq$ 80 mmHg*        | 54-105 |
| T-Score <sup>#</sup>            | 21 | -0.83 $\pm$ 1.1  | $\geq$ -1 <sup>#</sup> | -3 - 1 |
| Z-Score <sup>#</sup>            | 25 | -0.32 $\pm$ 0.94 | > -2.0 <sup>#</sup>    | -2 - 1 |

\*Target values based on current American Heart Association Guidelines

<sup>#</sup> T-and Z score target values based on the International Society for Clinical Densitometry

Table 6. Blood Pressure Classification Overall and by Gender

| Category*                                     | Overall N | Overall N (%) | Males N (%) | Females N (%) | X <sup>2</sup> | p            |
|---|-----------|---------------|-------------|---------------|----------------|--------------|
| Systolic Blood Pressure<br>Optimal $\leq$ 120 | 86        | 42 (49.4%)    | 3 (16%)     | 35 (52%)      | 7.26           | <b>0.007</b> |
| Elevated > 120                                |           | 43 (50.6%)    | 15 (83%)    | 32 (48%)      |                |              |
| Diastolic Blood Pressure<br>Optimal $\leq$ 80 | 86        | 63 (73.3%)    | 10 (56%)    | 49 (72%)      | 1.80           | 0.180        |
| Elevated > 80                                 |           | 23 (26.7%)    | 8 (44%)     | 19 (28%)      |                |              |

\* based on current American Heart Association Guidelines

By gender, the mean SBP among men (n=18) was 129.3  $\pm$  10.2 mmHg, ranging from 113 to 157 mmHg (Table 7). Among females (n=67), the mean SBP was 120.2  $\pm$  16.0 mmHg, ranging from 92 to 169 mmHg (Table 7). There was a significant difference in systolic blood pressure between males and females (t=2.94; p = 0.005), with the males having a SBP 9.6 mmHg higher than females (Table 7).

By blood pressure classification, only 3 (16%) of the males had optimal SBP ( $\leq$  120 mmHg) (Table 6). In contrast, over half (52%; n=35) of females had an optimal SBP. There was

a significant difference in the proportion of males who had an elevated systolic blood pressure between males and females ( $X^2=7.26$ ;  $p = 0.007$ ) (Table 6).

Table 7. Clinical Measures by Gender

|                                | Gender | n  | Mean $\pm$ SD    | t    | p            |
|--------------------------------|--------|----|------------------|------|--------------|
| Systolic Blood Pressure, mmHg  | Male   | 18 | 129.3 $\pm$ 10.2 | 2.94 | <b>0.005</b> |
|                                | Female | 67 | 120.2 $\pm$ 16.0 |      |              |
| Diastolic Blood Pressure, mmHg | Male   | 18 | 77.3 $\pm$ 10.3  | 0.88 | 0.383        |
|                                | Female | 68 | 74.7 $\pm$ 11.3  |      |              |
| T-score                        | Male   | 0  | -                | -    | -            |
|                                | Female | 21 | -0.83 $\pm$ 1.1  |      |              |
| Z-score                        | Male   | 0  | -                | -    | -            |
|                                | Female | 22 | -0.29 $\pm$ 0.98 |      |              |

#### Diastolic Blood Pressure

Overall, 86 individuals had their diastolic blood pressure (DBP) recorded. Among these individuals, the mean DPB, overall, was 75.2- $\pm$  11.1 mmHg, with values ranging from 54 to 105 mmHg (Table 5). By gender, the mean DBP among men (n=18) was 77.3  $\pm$  10.3 mmHg, with a range of 60 to 105 mmHg. Women (n=68), on average, had a DBP of 74.7  $\pm$  11.3, with a range of 54 to 104. There was no significant difference in DBP between males and females ( $t=0.876$ ;  $p =0.383$ ) (Table 7).

By blood pressure classification, overall, three-quarters (73.3%; n=63) of the participants had a DBP in the optimal range ( $\leq 80$  mmHg) (Table 6). By gender, slightly more than half of the men (56%; n=10), and three-quarters of the women (72%; n=49), had a DBP in the optimal range ( $\leq 80$  mmHg) (Table 6).

Of the 63 participants (11 males and 52 females) with high blood pressure, indicated as either SBP > 120 mmHg or DBP >80 mmHg, 56 (89%; 7 males and 49 females) did not mark or



did not know they had high blood pressure on the NAL-Q. Only seven (4 males and 3 females) indicated they had high blood pressure.

#### T-Score

Overall, 21 participants (0 males; 21 females) had a recorded bone-density T-score. Overall, the mean T-score was  $-0.83 \pm 1.1$ , with a range of -3 to 1 (Table 5). The majority of female participants (71.2%; n=15) had a T-score in the normal range ( $\geq -1$ ). Six participants had T-scores outside the normal range. Of these, three had a T-score in the osteopenia range (between -1 and -2.5) and three had a T-score in the osteoporosis range (-2.5 and below). There was no data on T-score in males and therefore a difference between males and females was not calculated (Table 7).

#### Z-Score

Overall, 22 participants (0 males; 22 females) had a recorded Z-score (with a Z-score of -2 or lower indicating something other than aging is causing abnormal bone loss). Overall, the mean Z score was  $-0.32 \pm 0.94$ , with a range of -2 to +1 (Table 5). All participants (100%; n=25) had a Z-score in the normal range ( $> -2$ ). Among females (n=22), the mean Z-score was  $-0.29 \pm 0.98$ , with a range of -2 to 1. There was no data on T-score in males and therefore a difference between males and females was not calculated (Table 7).

#### **RQ#2-a: Health-Related Conditions**

The NAL-Q included the question, “I came to the Nutrition Assessment Lab because I want to (check all that apply),” and participants were able to select from a list of 12 answers or include a free-form response.

Results indicate the most prevalent reasons participants came to the NAL were to lose weight (65.1%; n=151) and to improve their overall diet (56.9%; n=132) (Figure 8). Over a third of the participants indicated they were interested in learning more about diet/exercise (35.3%; n=82) or starting a diet/exercise routine (34.1%; n=79) (Figure 8).

Among men (n=44), the most common responses were to improve their overall diet (56.8%; n=25) and to lose weight (50%; n=22). Additional reasons for coming to the NAL included to: 1) start a diet/exercise routine (40.9%; n=18); 2) learn about diet/exercise (34.1%; n=15); 3) lower cholesterol (34.1%; n=15), 4) help blood pressure (29.5%; n=13); 5) have more energy (27.3%; n=12); 6) help back, legs, joints (11.4%; n=5); 7) help diabetes (11.4%; n=5); 8) help prevent osteoporosis (6.8%; n=3); and 9) help a heart condition (2.3%; n=1).

Among women (n=188), the most common response was to lose weight (68.6%; n=129) and to improve overall diet (56.9%; n=107). Additional reasons for coming to the NAL included to: 1) have more energy (39.4%; n=74); 2) learn about diet/exercise (35.6%; n=67); 3) start a diet/exercise routine (32.4%; n=61); 4) lower cholesterol (26.6%; n=50); 5) identify health risks (n=25%; n=47); 6) help back, legs, joints, etc. (22.3%; n=42); 7) prevent osteoporosis (11.75%, n=22); 8) help blood pressure (11.2%; n=21); 9) help diabetes (11.2%; n=21); and 12) help a heart condition 6.4%; n=12).

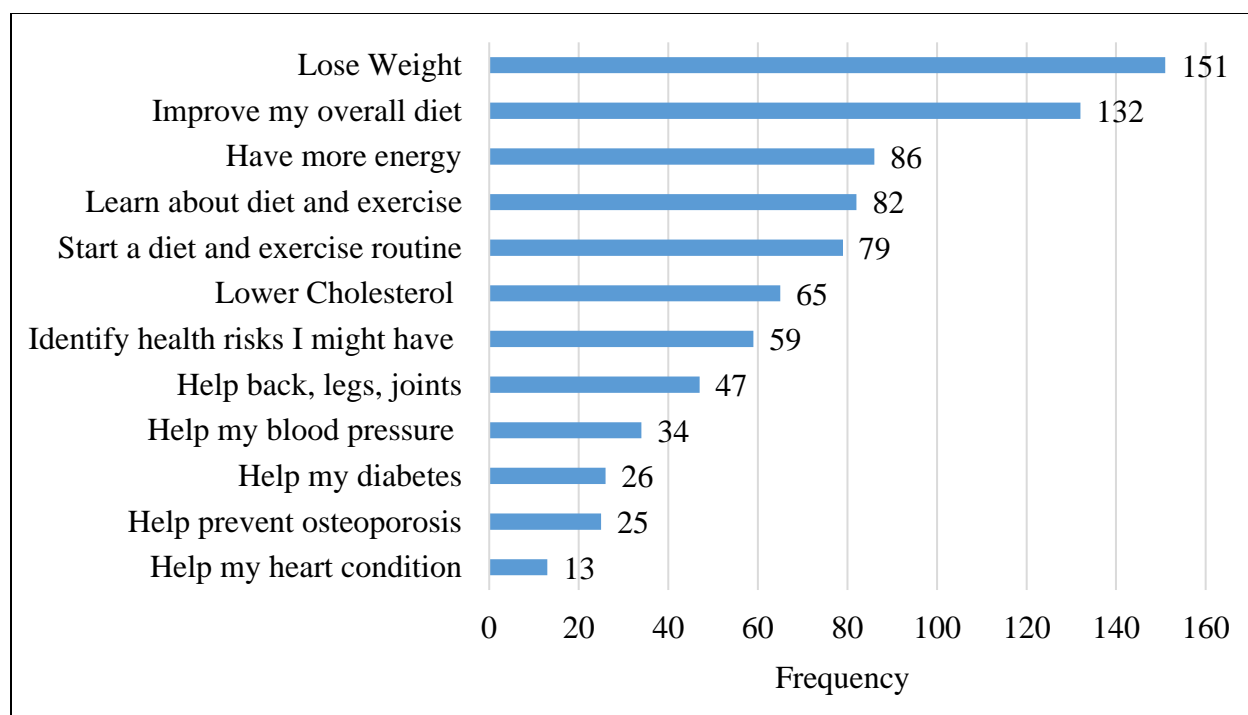


Figure 8. Responses to the Question, “I came to the Nutrition Assessment Lab because I Want to” (Check All that Apply) (N=232)

This survey question included a space for participants to write in a response. The responses of “blood sugar” (0.9%; n=2) and “reduce body fat” (0.9%; n=2) were each indicated twice. Other responses included “achieve numbers,” “acid reflux,” “gain weight,” “headache,” “vitamins,” “prevent diabetes,” “healthy decisions,” etc.

### RQ#2-b: Health-Related Programs Desired

In response to the question, “What programs would you like the Nutrition Lab to offer?” the largest percentage of participants were interested in menu planning advice (55.2%; n=128) and healthy eating discussions (48.3%; n=112) (Table 8). Other free responses were “diet, exercise, & adult health issues for pre-retirees,” “exercise competition,” “foods that reduce or prevent inflammation in the body,” “how to cook for a family when children won’t eat healthy

food,” “kid friendly nutrition,” “snack ideas,” “support groups,” “survive campus dining,” “vitamins,” and “wellness competition.”

Among men, half were interested in menu planning advice (50%; n=22) and healthy eating discussions (50%; n=22). One-quarter of men were interested in weight loss competitions (25%; n=11) and 11.4% (n=5) were interested in supermarket tours. Among women, the largest percentage were interested in menu planning advice (56.4%; n=106). Slightly less than half of women were interested in health eating discussions (47.9%; n=90). Less than one-quarter were interested in weight loss competitions (21.3%; n=40) and 12.2% (n=23) were interested in supermarket tours.

Table 8. Programs Participants Indicated They Would like the Nutrition Lab to Offer (N=232)

| Nutrition-Related Programs Desired | Overall<br>N (%) | Male<br>N | Females<br>N |
|------------------------------------|------------------|-----------|--------------|
| Menu Planning Advice               | 128 (55.2)       | 22        | 106          |
| Healthy Eating Discussions         | 112 (48.3)       | 22        | 90           |
| Healthy Cooking Demonstrations     | 63 (27.2)        | 11        | 52           |
| Weight Loss Competitions           | 51 (22.0)        | 11        | 40           |
| Supermarket Tours                  | 28 (12.1)        | 5         | 23           |

### **RQ#3: Health Habits and Conditions**

To identify the health habits, behaviors, and health-related conditions of the participants, responses from a series of questions obtained from the Nutrition Assessment Enrollment Form were analyzed.

## Physical Activity

Nearly two-thirds (65.9%; n=153) of the participants indicated they take part in physical three or more days per week (Table 9). Of these, 56% (n=86) indicated they took part in physical activity 3-4 days per week and 44% (n=67) indicated they engaged in physical activity 5-7 days per week. Nearly one-quarter (24.1%; n=56) of the respondents indicated they participated in physical activity 1-2 days per week. Less than 10% of the participants indicated they did not engage in any physical activity (8.6%; n=20). Three people (1.3%) did not respond to the question.

Among men (n=44), more than three-quarters (81.8%; n=36) indicated they participated in physical activity at least three times per week. Of these, 52.3% indicated they participated 3-4 times per week (n=23) and an additional 29.5% indicated they engaged in physical activity at least 5-7 days per week (n=13). Only 15.9% (n=7) of the men indicated they participated in physical activity 1-2 days per week. Only one male (2.3%) indicated he did not take part in any physical activity.

Among women, slightly less than two-thirds (62.2%; n=117) indicated they participated in physical activity at least three times per week. Of these, 53.8% (n=63) indicated they participated in physical activity 3-4 days per week and 46.2.7% indicated they engaged in physical activity at least 5-7 days per week (n=54). More than one-quarter (26.1%; n=49) of the respondents indicated they participated in physical activity 1-2 days per week. Nineteen women (8.6%) indicated they did not take part in any physical activity. Three women did not answer the question. Overall, there was no significant difference in frequency of physical activity between men and women ( $X^2 = 8.158$ ;  $p = 0.086$ ).

### Duration of Physical Activity

Clients were asked to respond to the question “On days when I take part in physical activity, I usually spend \_\_\_\_ minutes in this activity.” Overall, the mean number of minutes spent in physical activity duration among those who indicated any value greater than zero was  $42.9 \pm 23.1$  minutes, ranging from 5 to 240 minutes. By gender, males indicated they engaged in physical activity an average of  $46.1 \pm 22.9$  minutes. Among females, the mean duration of physical activity was  $42.1 \pm 23.1$  minutes. There was no significant difference in duration of physical activity by gender ( $t=1.002$ ;  $p=0.318$ ).

### Alcohol Consumption

Clients who completed the Nutrition Assessment Enrollment Form were asked how frequently they typically consumed alcoholic beverages. Among those who consume alcohol, slightly less than half (41.8%;  $n=97$ ) consumed alcohol “rarely,” 17.7% ( $n=41$ ) indicated they consumed alcohol “weekly” and 3.0% ( $n=7$ ) reported consuming alcohol “daily.” Slightly less than one-third indicated they “never” consume alcohol (30.6%;  $n=71$ ) (Table 9).

By gender, among men who reported consuming alcohol, over half (52.3%;  $n=23$ ) reported they consumed alcoholic beverages “rarely,” 22.7% ( $n=10$ ) consumed alcohol “weekly,” and 2.3% ( $n=1$ ) consumed alcohol daily. One-fifth of the men (20.5%;  $n=9$ ) indicated they never consumed alcohol. One male did not answer the question.

Among women who reported consuming alcohol, 39.4% ( $n=74$ ) reported they consumed alcoholic beverages “rarely,” 16.5% (31) consumed alcohol “weekly,” and 3.2% ( $n=6$ ) consumed alcohol “daily.” One out of every three woman (33%;  $n=62$ ) indicated they never drank alcohol. Fifteen women (8.0%;  $n=15$ ) did not answer the question. There was no difference in alcohol consumption by gender ( $X^2=5.817$ ;  $p=0.213$ ).

Table 9. Responses to the Health Habits and Conditions Questions in the NAL-Q (N=232)

| Question  | Overall<br>N | Males<br>N | Females<br>N | X <sup>2</sup> | p     |
|---|--------------|------------|--------------|----------------|-------|
| “In a typical week, I take part in physical activity ____ days/week.” |              |            |              |                |       |
| None  | 20           | 1          | 19           | 8.158          | 0.086 |
| 1-2 days  | 56           | 7          | 49           |                |       |
| 3-4 days  | 86           | 23         | 63           |                |       |
| 5-7 days  | 67           | 13         | 54           |                |       |
| Not marked  | 3            | 0          | 3            |                |       |
| “I typically consume alcoholic beverages.”                            |              |            |              |                |       |
| Never   | 71           | 9          | 62           | 5.817          | 0.213 |
| Rarely  | 97           | 23         | 74           |                |       |
| Weekly  | 41           | 10         | 31           |                |       |
| Daily   | 7            | 1          | 6            |                |       |
| Not Marked  | 16           | 1          | 15           |                |       |
| “I smoke cigarettes, cigars, or chew smokeless tobacco.”              |              |            |              |                |       |
| Never   | 181          | 33         | 148          | 0.916          | 0.822 |
| Used to; quit   | 25           | 6          | 19           |                |       |
| Yes   | 3            | 1          | 2            |                |       |
| Not Marked  | 23           | 7          | 19           |                |       |
| “In the past few months I have:”                                      |              |            |              |                |       |
| Lost weight on purpose  | 45           | 14         | 31           | 8.18           | 0.085 |
| Lost weight not on purpose  | 11           | 1          | 10           |                |       |
| Stayed at current weight  | 105          | 21         | 84           |                |       |
| Gained weight   | 67           | 8          | 59           |                |       |
| Not Marked  | 4            | 0          | 7            |                |       |
| “I think my overall health is:”                                       |              |            |              |                |       |
| Very good   | 39           | 9          | 30           | 2.43           | 0.787 |
| Good  | 121          | 19         | 102          |                |       |
| Fair  | 61           | 14         | 47           |                |       |
| Poor  | 9            | 2          | 7            |                |       |
| Very poor   | 1            | 0          | 1            |                |       |
| Not Market  | 1            | 0          | 1            |                |       |

### Tobacco Use

Overall, 78.0% (n=181) of the 232 respondents indicated they did not currently use tobacco; 10.8% of the respondents (n=25) indicated they used to use tobacco but had quit. Only

three respondents (1.3%) indicated they currently used tobacco. Almost one out of every 10 respondents (9.9%; n=23) did not answer the question (Table 9).

By gender, 75% (n=33) of men indicated they did not currently use tobacco; 13.6% (n=6) indicated they “used to” use tobacco. Only one individual (2.3%) indicated they currently used tobacco products. Four male respondents (9.1% (n=4) did not answer the question. Among women, 78.7% (n=148) indicated they did not use tobacco; 10.1% (n=19) indicated they used to use tobacco products. Two women (1.1%) indicated they currently used tobacco products. Nineteen women (10.1%) did not answer the question. There was no significant difference in tobacco use by gender ( $X^2=0.916$ ;  $p =0.822$ ).

### Weight Changes

Participants were asked to indicate if they had gained or lost weight in the previous few months. Overall, almost half of the participants (45.3%; n=105) indicated they had maintained their weight in the past few months (Table 9). Over one-quarter (28.9%; n=67) of the respondents indicated they had gained weight in the past few months. One out of every five clients (19.4%; n=45) reported they had lost weight on purpose. Eleven individuals (4.7%) reported they had lost weight, but not on purpose. Four individuals did not answer the question.

By gender, slightly less than half (47.7%; n=21) of the men indicated they had stayed at their current weight over the previous few months. Approximately one out of every three males (31.8%; n=14) reported they had lost weight on purpose. One man (2.3%) indicated he had lost weight, but not on purpose. Eight men (18.2%) indicated they had gained weight over the previous few months.

Among women, 44.7% (n=84) reported they had stayed at their current weight over the previous few months. Thirty-one women (16.5%) reported they had lost weight on purpose. Ten



women (5.3%) indicated they had lost weight, but not on purpose. Almost one-third of the women (n=59; 31.4%) indicated they had gained weight over the previous few months. Four women (2.1%) did not answer the question. There was no significant difference in weight change over the past few months by gender ( $X^2=8.18$ ;  $p=0.085$ ).

### Self-perceived Health

Participants were asked to self-rate their overall health using five descriptors ranging from ‘very good’ to ‘very poor.’ Overall, more than two-thirds (69.0%; n=160) of the respondents rated their health as “good” (52.2%; n=121) or “very good” (16.8%; n=39) (Figure 9). One out of every four participants indicated their health was ‘fair’ (26.3%; n=4). Ten (4.3%) participants indicated their health was “poor” (3.9%; n=9) or “very poor” (0.4%; n=1).

By gender, 63.6% (n=28) of the men (n=40) rated their health as “good” (43.2%; n=19) or “very good” (20.5%; n=9). Less than one-third (31.8%; n=14) of the men rated their health as “fair.” Two (4.5%) participants rated their health as “poor.” No males rated their health as “very poor.”

Among women, 70.2% (n=132) rated their overall health as “good” (54.3%; n=102) or “very good” (16.0%; n=30). One of every four (25%; n=47) women rated their health as “fair.” Eight of the women rated their health as either “poor” (3.7%; n=7) or “very poor” (0.5%; n=1). One woman did not answer the question (Figure 9). There was no significant difference in self-rated overall health by gender ( $X^2=2.43$ ;  $p=0.787$ ).

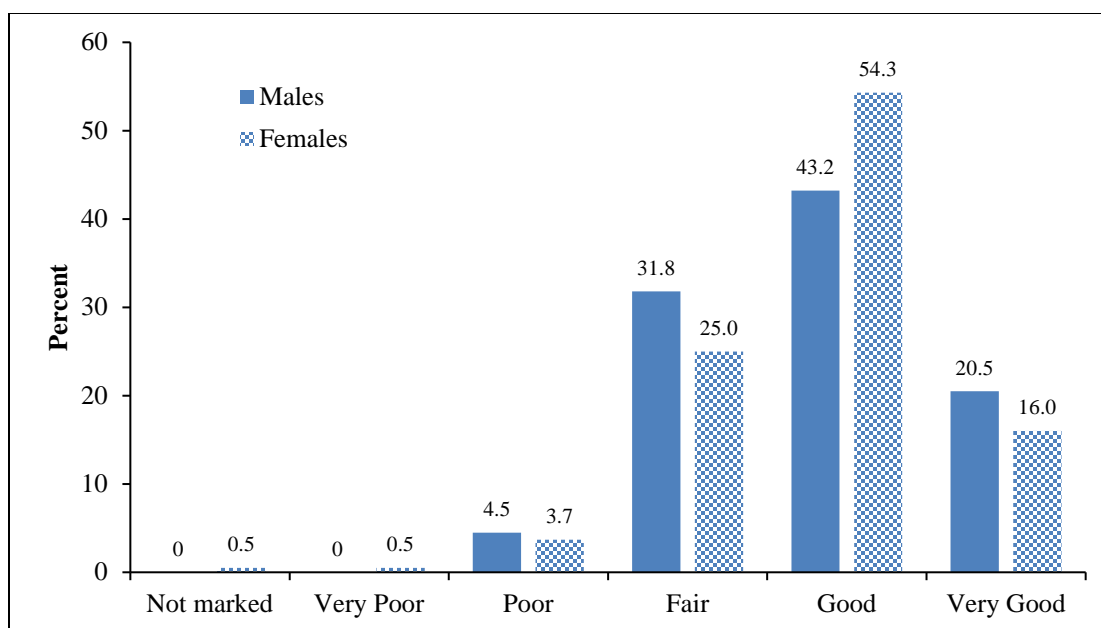


Figure 9. Responses to the Question “I Think My Overall Health is:” on the NAL-Q (n=232)

### Health Conditions

Clients who received services at the Nutrition Assessment Laboratory were asked to indicate their current health conditions on the NAL-Q. Overall, the most prevalent self-reported health conditions were high cholesterol (25.9%; n=60) and high blood pressure (18.1%; n=42) (Figure 10). Other health conditions indicated were pre-diabetes (11.2%; n=26), diabetes (6.9%; n=16), high triglycerides (8.2%; n=19), osteopenia/osteoporosis (5.6%; n=13) and pre-hypertension (3.0%; n=7).

Among men, the most prevalent reported health condition was high blood pressure (29.5%; n=13), followed by high cholesterol (25%; n=11). Other health conditions indicated among men were prediabetes (15.9%; n=7), high triglycerides (11.4%; n=5), diabetes (9.1%; n=4), pre-hypertension (9.1%; n=4), and osteopenia/osteoporosis (2.3%; n=1) (Figure 10).

Among women, the most prevalent reported health condition was high cholesterol (26.1%; n=49), followed by high blood pressure (15.4%; n=29). Other health conditions

indicated among women were prediabetes (10.1%; n=19), high triglycerides (7.4%; n=14), diabetes (6.4%; n=12), osteopenia/osteoporosis (6.4%; n=12), and pre-hypertension (1.6%; n=3) (Figure 10). Statistically significant differences were detected by gender for high blood pressure ( $X^2 = 4.795$ ;  $p = 0.029$ ) and pre-hypertension ( $X^2 = 6.845$ ;  $p = 0.009$ ).

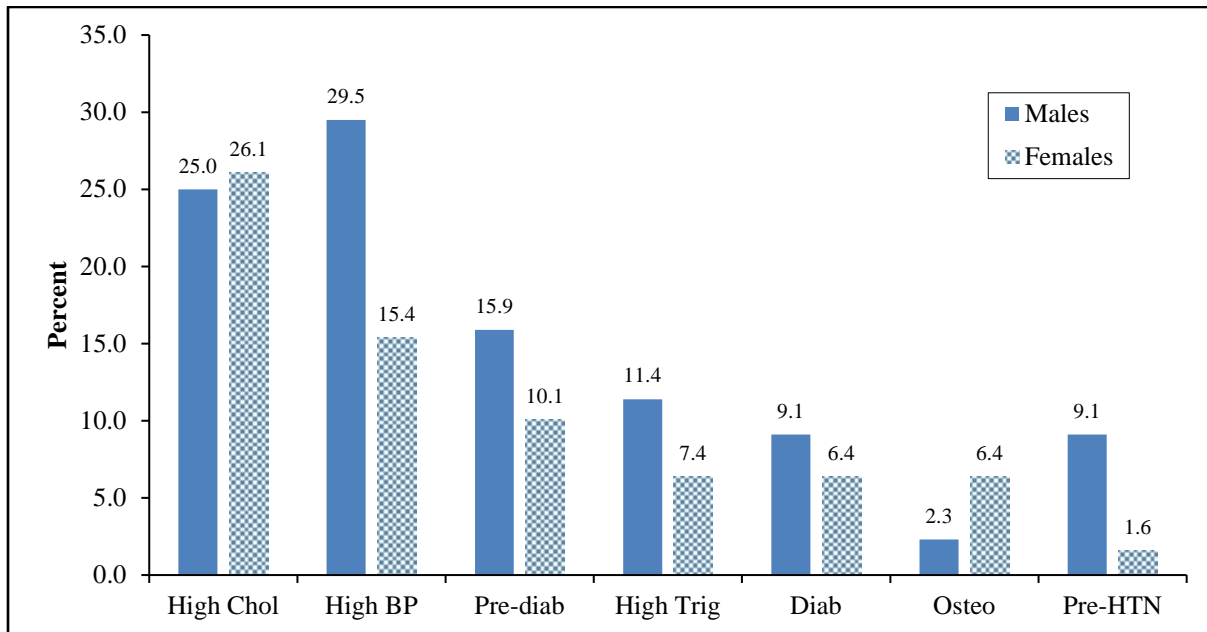


Figure 10. Percent of Participants by Gender in Response the Question “My Health Conditions Are” (N=232)

In addition to these seven health conditions, clients were invited to provide other responses to the question, “My health conditions are...” The responses obtained, in alphabetical order, are reported in Table 11, with the most common responses being asthma (n=3) and polycystic ovarian syndrome (PCOS) (n=3).

Table 10. Additional Responses to the Question, “My health conditions are...:”

| Other Health Conditions Reported        | n |
|---|---|
| Allergies, recovering from knee surgery | 1 |
| Anemia                                  | 1 |
| Ankylosing spondylitis                  | 1 |
| Anxiety and acid reflux                 | 1 |
| Asthma                                  | 3 |
| Crohn’s disease                         | 2 |
| COPD                                    | 1 |
| Fatty liver & weight loss               | 1 |
| Fibromyalgia                            | 1 |
| GERD                                    | 2 |
| Gluten free                             | 1 |
| H. pylori/diverticulitis                | 1 |
| Hashimoto’s thyroiditis                 | 1 |
| HTN                                     | 1 |
| Hypoglycemia                            | 2 |
| Hypothyroid                             | 2 |
| Insulin resistance                      | 1 |
| Kidney stones                           | 1 |
| Multiple Sclerosis                      | 1 |
| Migraines                               | 1 |
| No ovaries                              | 1 |
| Osteoarthritis                          | 1 |
| PCOS                                    | 3 |
| Rheumatoid Arthritis                    | 1 |
| Sjogren’s syndrome                      | 1 |
| Thyroid                                 | 2 |

#### **RQ#4. Nutrition Habits**

The NAL-Q included eight questions about nutrition habits of the clients who come to the Nutrition Assessment Laboratory. Six of the questions addressed the client’s dietary intake of fruit and vegetables, dairy products, grains products, and whole grains. Three questions

addressed whether or not participants limit their dietary fat, use food labels, or take nutrient supplements. The results are analyzed both overall and by gender.

### Servings of Fruits and Vegetables

In response to the question, “On a typical day, I usually eat or drink \_\_\_ servings of fruits and vegetables per day,” the largest percentage (29.3%; n=68) of participants indicated they consumed two servings per day of fruits and vegetables. The mean intake of fruit and vegetables was  $2.25 \pm 1.35$  servings per day. Only 6.9% (n=16) of the participants reported consuming the recommended five or more servings of fruits and vegetables per day. Although not meeting the goal, 10.8% (n=25) reported consuming fruits and vegetables 4 times per day, with an additional 22.4% (n=52) reported consuming fruits and vegetables 3 times per day. More than one out of every four participant reported they only ate fruits and vegetables once per day (24.1%; n=56) or not at all (4.3%; n=10) (Table 11).

By gender, the largest percentage (40.9%; n=18) of males reported consuming only one serving of fruits and vegetables per day. The mean intake of fruit and vegetables among males was  $1.91 \pm 1.27$  servings per day. Only 6.8% (n=3) of the men reported consuming the recommended 5 or more servings of fruits and vegetables per day. Although not meeting the goal, 2.3% (n=1) reported consuming fruits and vegetables 4 times per day, with an additional 18.2% (n=8) reported consuming fruits and vegetables 3 times per day. Slightly more than one out of every four men (27.3%; n=12) consumed two servings of fruits and vegetables per day. Forty-three percent of the male participants reported they only ate fruits and vegetables once per day (40.9%; n=18) or not at all (2.3%; n=1) (Figure 11).

Table 11. Participants' Responses to the Nutrition Habits Questions on the NAL-Q (N=232)

| Variable  | Overall<br>N | Male<br>N | Female<br>N | $\chi^2$ | p     |
|---|--------------|-----------|-------------|----------|-------|
| “On a typical day, I usually eat or drink ___ servings of fruits/vegetables.” |              |           |             |          |       |
| None  | 10           | 1         | 9           | 11.008   | 0.088 |
| 1   | 56           | 18        | 38          |          |       |
| 2   | 68           | 12        | 56          |          |       |
| 3   | 52           | 8         | 44          |          |       |
| 4   | 25           | 1         | 24          |          |       |
| 5 or more   | 16           | 3         | 13          |          |       |
| Not Market  | 5            | 1         | 4           |          |       |
| “On a typical day, I eat or drink dairy products ___ times per day.”          |              |           |             |          |       |
| None  | 28           | 5         | 23          | 0.132    | 0.998 |
| 1   | 88           | 17        | 71          |          |       |
| 2   | 73           | 14        | 59          |          |       |
| 3 or more   | 34           | 6         | 28          |          |       |
| Not Marked  | 9            | 2         | 7           |          |       |
| “I usually eat bread and cereal products ___”                                 |              |           |             |          |       |
| Seldom/none   | 16           | 1         | 15          | 4.355    | 0.500 |
| 1-2 times per day   | 112          | 19        | 93          |          |       |
| 3-4 times per day   | 74           | 18        | 56          |          |       |
| 5-6 times per day   | 15           | 3         | 12          |          |       |
| 7-8 times per day   | 3            | 0         | 3           |          |       |
| 9 or more times per day   | 0            | 0         | 0           |          |       |
| Not Marked  | 12           | 3         | 9           |          |       |
| “I usually eat whole grain products ___”                                      |              |           |             |          |       |
| Seldom/none   | 47           | 3         | 42          | 7.013    | 0.320 |
| 1 time per day  | 91           | 5         | 68          |          |       |
| 2 times per day   | 56           | 23        | 46          |          |       |
| 3 times per day   | 19           | 10        | 16          |          |       |
| 4 or more times per day   | 4            | 3         | 4           |          |       |
| Unsure  | 4            | 0         | 4           |          |       |
| Not marked  | 11           | 3         | 8           |          |       |
| “I try to limit the amount of fat in my diet.”                                |              |           |             |          |       |
| Yes, all the time   | 70           | 15        | 55          | 1.082    | 0.781 |
| Sometimes   | 128          | 23        | 105         |          |       |
| No, not really  | 27           | 4         | 23          |          |       |
| Not Marked  | 7            | 2         | 5           |          |       |
| “I use food labels to help me choose food items”                              |              |           |             |          |       |
| Yes, all the time   | 96           | 16        | 4           | 3.631    | 0.304 |
| Sometimes   | 64           | 16        | 74          |          |       |
| No, not really  | 64           | 10        | 85          |          |       |
| Not Marked  | 8            | 2         | 25          |          |       |
| “I take nutrient supplements.”  |              |           |             |          |       |
| Yes, daily  | 96           | 18        | 78          | 1.010    | 0.799 |
| Sometimes   | 64           | 14        | 50          |          |       |
| No, not regularly   | 64           | 10        | 54          |          |       |
| Not Marked  | 8            | 2         | 6           |          |       |

Among women, the largest percentage (29.8%; n=44) of females reported consuming two servings of fruits and vegetables per day. The mean intake of fruit and vegetables among females was  $2.34 \pm 1.35$  servings per day. There was no difference in fruit and vegetable consumption by gender ( $t=1.89$ ;  $p=0.06$ ). Similar to the men, only 6.9% (n=13) of the women reported consuming the recommended 5 or more servings of fruits and vegetables per day. Although not meeting the goal, 12.8% (n=24) of the women reported consuming fruits and vegetables 4 times per day, with an additional 23.4% (n=44) consuming fruits and vegetables 3 times per day. Slightly more than one out of every four women (29.8%; n=56) reported consuming two servings of fruits and vegetables per day. Twenty-five percent of the female participants reported they only ate fruits and vegetables once per day (20.2%; n=38) or not at all (4.8%; n=9) (Figure 11). There was no difference in serving per day of fruits and vegetables by gender ( $X^2=11.008$ ;  $p=.088$ ).

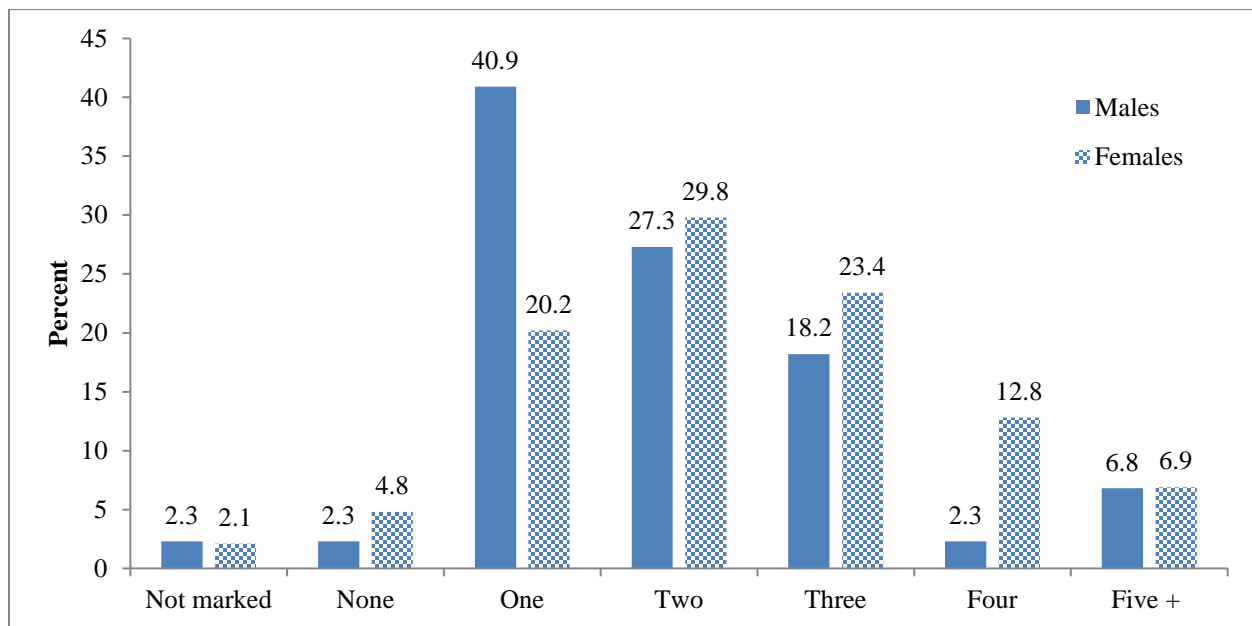


Figure 11. Percent of Participants by Gender in Response to the Question, “On a typical day, I usually eat or drink \_\_\_ servings of fruits and vegetables.” (N=232)

### Servings of Dairy

In response to the question, “On a typical day, I eat or drink dairy products \_\_\_\_ times per day, the largest percentage (37.9%; n=88) of participants reported consuming dairy products once per day (Figure 12). The mean number of dairy food consumed per day was  $1.41 \pm 1.01$ . Only 14.7% (n=34) consumed the recommended three servings of dairy foods per day (Table 11).

By gender, the mean intake of dairy foods among males was  $1.39 \pm 1.02$  servings per day. The largest percentage of males (38.6%; n=17) consumed one serving of dairy products per day; 31.8% (n=14) reported consuming two servings per day, and 11.4% (n=5) reported having no servings of dairy per day. Only 13.6% (n=6) of the respondents indicated they consumed the recommended three servings of dairy products per day.

Females, on average, reported consuming  $1.41 \pm 1.01$  servings of dairy foods per day. There was no difference in dairy consumption by gender ( $t=0.169$ ;  $p=0.866$ ). Similar to men, the largest percentage of women (37.8%; n=71) only consumed one serving of dairy products per day, followed by 31.4% (n=59) having two servings per day, and 12.2% (n=23) having no servings of dairy per day. Only 14.9% (n=28) of the women reported consuming the recommended three servings of dairy products per day. There was no difference by gender in the self-reported number of servings of dairy foods consumed daily ( $X^2=0.132$ ;  $p=.998$ ).



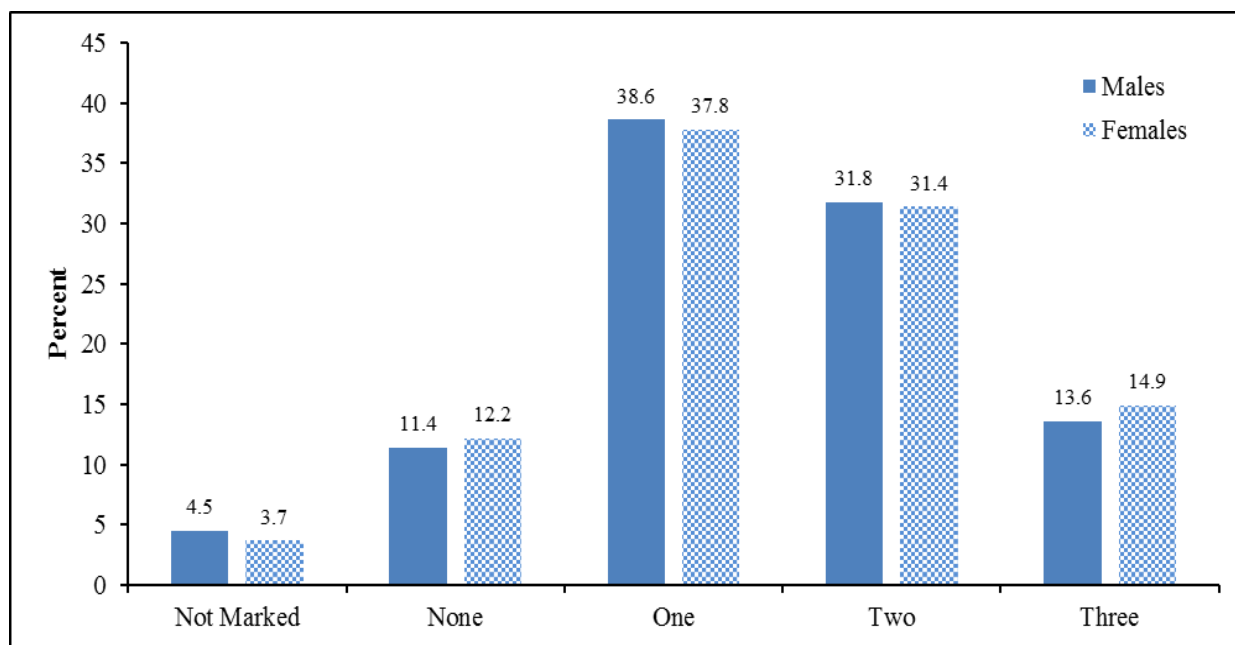


Figure 12. Percent of Participants by Gender in Response to the Question, “On a typical day, I usually eat or drink dairy products (e.g. milk, cheese, and yogurt) \_\_\_ times per day.” (N=232)

#### Type of Dairy Products Purchased (Percent Fat)

Overall, the largest percentage of participants (27.6%; n=64) reported buying nonfat dairy products most often (Figure 13), followed closely by 2% milk fat (25.9%; n=60). One out of every 10 clients did not know what percent milkfat products they purchase (9.5%; n=22).

Among males, non-fat dairy products were the most common type of dairy products purchased (34.1%; n=15) followed by 2% milkfat products (25%; n=11). Among females, the type of dairy fat products purchased was equally distributed between non-fat (26.1%; n=49) and 2% dairy fat (26.1%; n=49). There was no difference in the type of dairy products purchased by gender ( $X^2=2.493$ ;  $p=.869$ ).

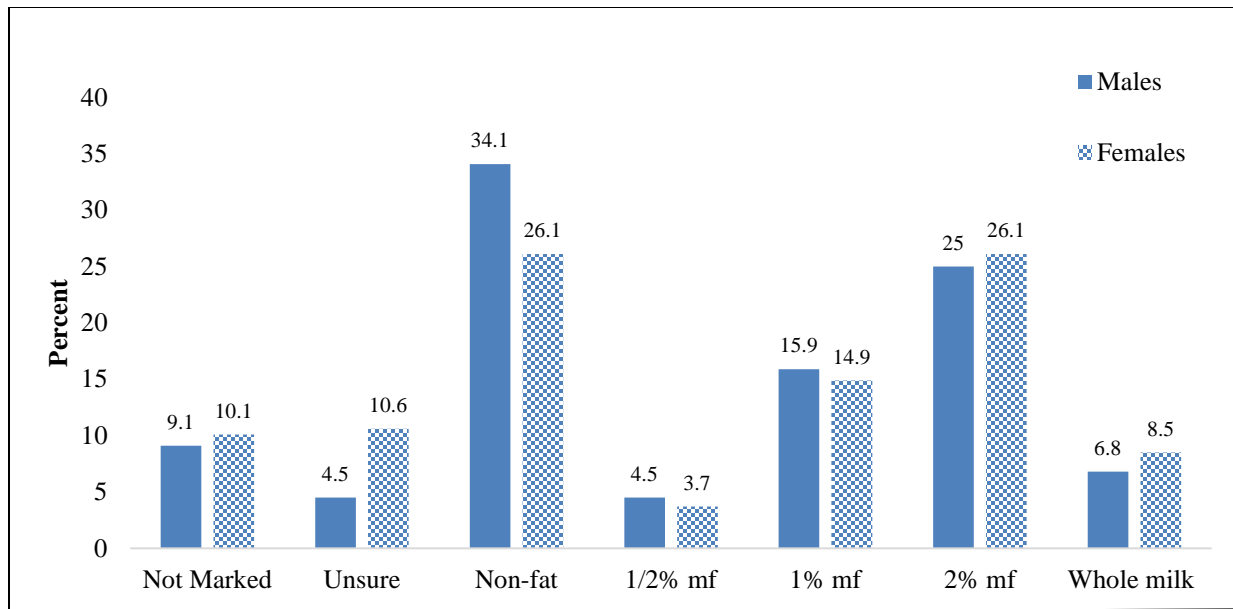


Figure 13. Responses to the Question, “The type of dairy products (e.g. milk, cheese, yogurt) I buy most often contain.” (N=232)

#### Servings of Grain Products

The largest percentage of participants reported consuming grain products 1-2 times per day (48.3%; n=112) (Table 11). Among males, 43.2% (n=19) reported consuming grain products 1-2 times per day, with 40.9% (n=18) indicating they consumed grain products 3-4 times per day. Among females, 49.5% (n=93) reported consuming grains 1-2 times per day, with 29.8% (n=56) indicating they consumed grain products 3-4 times per day. There was no significant difference in the self-reported daily number of servings of grain products consumed per day by gender ( $X^2=4.355$ ;  $p=0.500$ ).

#### Servings of Whole Grains

The largest percentage of participants indicated they consumed whole grain products, on average, one time per day (39.2%; n=91) (Table 11). Approximately one out of every four clients (24.1%; n=56) reported consuming whole grain products twice per day, while one in five (20.3%; n=47) reported they seldom or never consumed whole grain products (Figure 14). Only

9.9% (n=23) of the clients reported meeting the recommendation by consuming three or more servings of whole grain products per day.

By gender, over half (52.3%; n=23) of the males reported consuming whole grains only one time per day, with an additional 22.7% (n=10) indicating they consumed whole grains two times per day. Only 6.8% (n=3) of the males consumed the recommended three servings of whole grains per day.

Slightly more than one out of every three female clients (36.2%; n=68) reported consuming whole grain products only one time per day, with an additional 24.5% (n=46) consuming whole grain products two times per day. Only 10.6% (n=20) of the females consumed the recommended three servings of whole grains per day. There was no significant difference in the number of servings of whole grain products consumed per day by gender ( $X^2=7.013$ ;  $p=.320$ ).

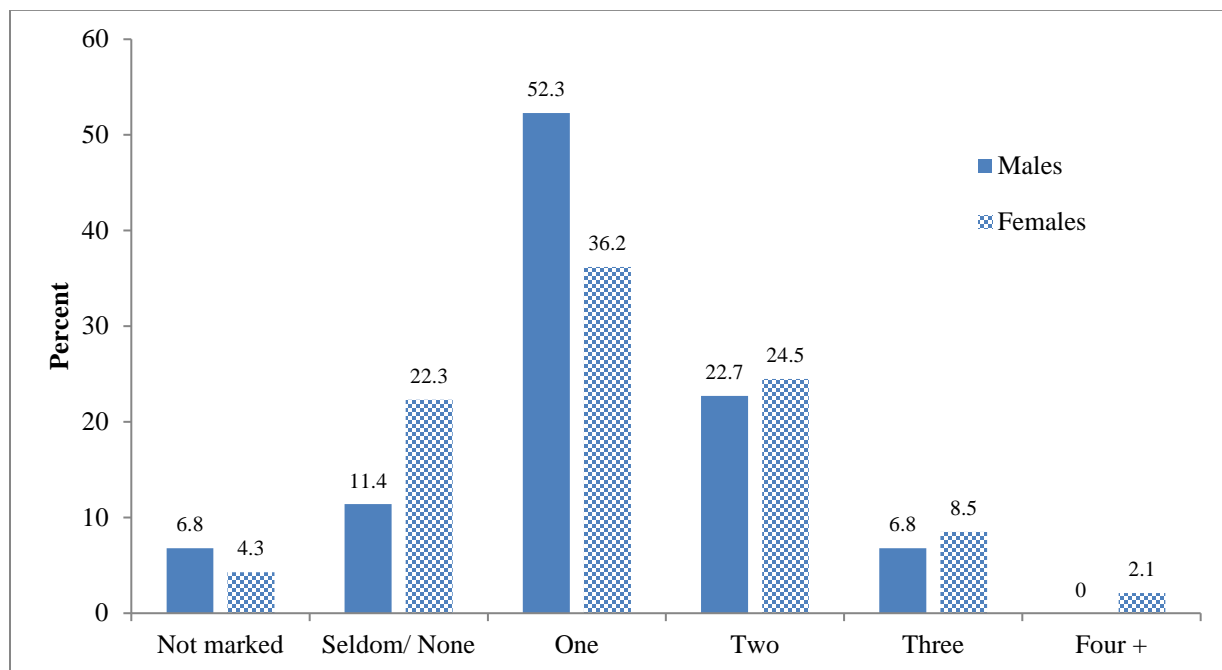


Figure 14. Responses to the Question, “I usually eat whole grain products \_\_\_\_ time per day (Ex. Brown rice, whole wheat bread, oatmeal, all bran cereal).” (N=232)

### Attempt to Limit Fat in the Diet

The vast majority (85.3%; n=198) of participants indicated they try to limit the amount of fat in their diet, with more than half (55.2%; n=128) indicating they “sometimes,” try to limit their fat and an additional 30.2% (n=70) indicating they try to limit the amount of fat in their diet “all the time” (Table 11).

By gender, over half (52.3%; n=23) of the male respondents indicated they “sometimes” or “always” (34.1%; n=15) try to limit the fat in their diet. Approximately 9.1% (n=4) indicated they did not try to limit the fat in their diet. Among the females, over half (55.9%; n=105) indicated they “sometimes” or “always” (29.3%; n=55) try to limit the fat in their diets. Approximately 12.2% (n=23) indicated they did not try to limit the fat in their diet. There was no difference in the intention of the participants to limit the fat in their diet by gender ( $X^2=1.082$ ;  $p=0.781$ ).

### Use of Food Labels

When asked if they use food labels choose foods, overall, almost half of the participants (43.5%; n=101) indicated “sometimes,” with slightly more than one-third (38.8%; n=90) of the participants (n=232) indicated they use food labels “all the time.” Only 15.1% (n=35) of the participants indicated “no, not really” when asked if they use food labels to help choose foods (Table 11).

By gender, an equal proportion of males (36.4%; n=16) indicated they use food labels “all the time” and “sometimes” to choose foods. Almost one-quarter of males (22.7%; n=10) indicated they really do not use food labels. Among females, almost half of the respondents (45.2%; n=85) indicated they “sometimes” use food labels to choose foods. Slightly fewer (39.4%; n=74) indicated they use food label “all the time” to choose foods. Only 13.3% (n=25)

of the females indicated they really do not use food labels. There was no difference in the use of food labels to choose foods by gender ( $X^2=3.631$ ;  $p=.304$ ).

### Nutrient Supplements

Less than half (41.4%) of the participants ( $n=232$ ) reported taking nutrient supplements daily, with 27.6% ( $n=64$ ) responding “sometimes,” and an equal proportion (27.6%;  $n=64$ ) indicating “no, not really” (Table 11).

By gender, 40.9% ( $n=18$ ) of males indicated they take nutrient supplements “all the time,” with 31.8% ( $n=14$ ) indicating they “sometimes” take nutrient supplements. Slightly more than one of every five (22.7%;  $n=44$ ) males indicated they did not take nutrient supplements. Among females, 41.5% ( $n=78$ ) responded they take nutrient supplements “all the time” with an additional 26.6% ( $n=50$ ) indicating they take nutrient supplements “sometimes.” Slightly more than one of every four females indicated they did not take nutrient supplements. There was no difference in the use of nutrient supplements by gender ( $X^2=1.010$ ;  $p=0.799$ ).

### **RQ#5 Stages in Prochaska's Stages of Change Theory for Various Health Habits**

The NAL-Q included questions that addressed the participants’ current Stage of Change regarding seven nutrition and health-related habits. The six responses to the questions were as follows: “I don’t do it and I don’t think about it,” “I think about it but do not do it,” “I feel ready to start,” “I do this sometimes,” “I usually do this,” and “I do this all the time.” These responses correspond to the Stages of Change stages of pre-contemplation, contemplation, preparation, early-action, action, and maintenance.

### Able to improve the types of healthy food eaten

In response to the statement, “I am able to improve the types of healthy foods I eat,” the largest percentage of participants (30.6%; n=71) reported, “I do this sometimes,” indicating they were in the early-action stage. Slightly fewer (28.9%; n=67) reported, “I usually do this” (late-action stage). More than one out of every five participants (22.8%; n=53) reported they “feel ready to start,” indicating they were in the preparation stage (Table 12). Only 9.5% (n=21) of participants were in the pre-contemplation (2.2%; n=5) or contemplation stage (6.9%; n=16).

Table 12. Responses to “Statement of Readiness” Questions on the NAL-Q Where the Shaded Area Indicates the Most Prevalent Response

| Stage  | Pre-contemplation                              | Contemplation                              | Preparation                    | Early-action                | Late-action                | Maintenance                     |
|--|--|--|--------------------------------|-----------------------------|----------------------------|---------------------------------|
| Statement of Readiness...  | I don't do and I don't think about it<br>n (%) | I think about it but do not do it<br>n (%) | I feel ready to start<br>n (%) | I do this sometime<br>n (%) | I usually do this<br>n (%) | I do this all the time<br>n (%) |
| I am able to improve the types of healthy food I eat             | 5 (2.2%)                                       | 16 (6.9%)                                  | 53 (22.8%)                     | 71 (30.6%)                  | 67 (28.9%)                 | 15 (6.5%)                       |
| I am able to lose weight   | 18 (7.8%)                                      | 28 (12.1%)                                 | 81 (34.9%)                     | 63 (27.2%)                  | 26 (11.2%)                 | 4 (1.7%)                        |
| I eat 2-3 servings of fruit ever day                             | 8 (3.4%)                                       | 19 (8.2%)                                  | 50 (21.6%)                     | 61 (26.3%)                  | 62 (26.7%)                 | 28 (12.1%)                      |
| I eat 2-3 servings of vegetables every day                       | 7 (3.0%)                                       | 19 (8.2%)                                  | 42 (18.1%)                     | 68 (29.3%)                  | 57 (24.6%)                 | 33 (14.2%)                      |
| I eat nonfat dairy products every day                            | 36 (15.5%)                                     | 21 (9.1%)                                  | 38 (16.4%)                     | 50 (21.6%)                  | 50 (21.6%)                 | 30 (12.9%)                      |
| I eat wholegrain bread and cereal products daily                 | 12 (5.2%)                                      | 14 (6.0%)                                  | 32 (13.8%)                     | 67 (28.9%)                  | 60 (25.9%)                 | 36 (15.5%)                      |
| I get 30 minutes of some type of aerobic activity 5 times a week | 11 (4.7%)                                      | 31 (13.4%)                                 | 48 (20.7%)                     | 39 (16.8%)                  | 53 (22.8%)                 | 44 (19.0%)                      |

By gender, when responding to the statement, “I am able to improve the types of healthy foods I eat,” the largest percentage of men reported they “usually do this” (34.1%; n=15), or they “sometimes do this” (27.3%; n=12), indicating they were already in the late or early action stage,

respectively. Among females, the largest percentage reported they “do this sometime” (31.4%; n=59) or they “usually do this,” (27.7%; n=52), indicating they are already in the early or late action stage, respectively. More than one out of every five participants (23.4%; n=59) reported they “feel ready to start” improving the food they eat, indicating they were in the preparation stage. There was no difference in the Stage of Change category by gender with regard to the participants’ ability to improve the types of healthy foods they eat ( $X^2=4.47$ ;  $p=0.614$ ).

#### Able to lose weight

In response to the statement, “I am able to lose weight,” the largest percentage of participants (34.9%; n=81) reported, “I feel ready to start,” indicating they were in the preparation stage. Slightly fewer (27.2%; n=63) reported, “I usually do this” (late action stage). More than one out of every ten participants (12.1%; n=28) reported they “think about it, but don’t do it,” indicating they were in the pre-contemplation stage (Table 12).

By gender, when responding to the statement “I am able to lose weight,” the largest percentage of men reported they “feel ready to start” (34.1%; n=15), or they “sometimes do this” (29.5%; n=13), indicating they were in the preparation or early action stage, respectively. Among females, the largest percentage reported they were “ready to start” (35.1%; n=66) or they “sometimes do this” (26.6%; n=50), indicating they were in the preparation or early action stage, respectively. There was no difference in the Stage of Change category by gender with regard to the participants’ ability to lose weight ( $X^2=7.24$ ;  $p=0.299$ ).



#### Able to eat 2-3 servings of fruit daily

In response to the statement, “I am able to eat 2-3 servings of fruit every day,” the largest percentage of participants (26.7%; n=62) reported, “I usually do this now,” indicating they were in late action stage. Slightly fewer (26.3%; n=61) reported, “I do this sometimes,” indicating they were in the early action stage. Nearly one out of every ten participants (8.2%; n=19) reported they “think about it, but don’t do it,” indicating they were in the pre-contemplation stage (Table 12).

By gender, when responding to the statement “I am able to eat 2-3 servings of fruit every day,” the largest percentage of men reported they “feel ready to start” (31.8%; n=14), or they “sometimes” (22.7%; n=10) or “usually” (22.7%; n=10) do this, indicating they were in the preparation or early and late action stages, respectively. Among females, the largest percentage reported they “usually do this now” (27.7%; n=52) or they “sometimes do this” (27.1%; n=51), indicating they were in the early action or preparation or stage, respectively. There was no difference in the Stage of Change category by gender with regard to the participants’ ability to eat 2-3 servings of fruit every day ( $X^2=4.05$ ;  $p=0.670$ ).

#### Able to eat 2-3 servings of vegetables daily

In response to the statement, “I am able to eat 2-3 servings of vegetables every day,” the largest percentage of participants (29.3%; n=68) reported, “I do this sometimes,” indicating they were in the early action stage. Slightly fewer (24.6%; n=33) reported, “I usually do this,” indicating they were in the late action stage. Nearly one out of every five participants (18.1%; n=42) reported they “feel ready to start,” indicating they were in the preparation stage (Table 12).

By gender, when responding to the statement “I am able to eat 2-3 servings of vegetables every day,” the largest percentage of men reported they “usually do this,” (29.5%; n=13), or they “sometimes” (22.7%; n=10) do this, indicating they were in the late or early action stage, respectively. Among females, the largest percentage reported they “sometimes do this” (29.3%; n=68) or they “usually do this now” (23.4%; n=44), indicating they were in the early action or late action stage, respectively. There was no difference in the Stage of Change category by gender with regard to the participants’ ability to eat 2-3 servings of vegetables every day ( $X^2=3.802$ ;  $p =0.703$ ).

#### Able to eat nonfat dairy products daily

In response to the statement, “I am able to eat nonfat dairy products every day,” the largest percentage of participants reported they “I do this sometimes” (21.6%; n=50) or they “usually do this” (21.6%; n=50), indicating they were in the early or late action stage, respectively. Slightly fewer (16.4%; n=38) reported they “feel ready to start,” indicating they were in the preparation stage with regard to eating nonfat dairy products daily (Table 12).

By gender, when responding to the statement ““I am able to eat nonfat dairy products every day,” the largest percentage of men reported they “feel ready to start,” (27.3%; n=12), or they “usually do it now” (20.5%; n=9), indicating they were in the preparation or late action stage, respectively. Among females, the largest percentage reported they “sometimes do this” (23.4%; n=44) or they “usually do this now” (21.8%; n=41), indicating they were in the early action or late action stage, respectively. There was no difference in the Stage of Change category by gender with regard to the participants’ ability to eat low-fat dairy products every day ( $X^2=6.407$ ;  $p =0.379$ ).

#### Able to eat whole grain bread and cereal products daily

In response to the statement, “I am able to eat whole grain bread and cereal products every day,” the largest percentage of participants reported they “I do this sometimes” (28.9%; n=67) or they “usually do this” (25.9%; n=60), indicating they were in the early or late action stage, respectively. Slightly fewer (13.8%; n=32) reported they “feel ready to start,” indicating they were in the preparation stage with regard to eating whole grain bread and cereal products daily (Table 12).

By gender, when responding to the statement “I am able to eat whole grain bread and cereal products every day,” the largest percentage of men reported they “do it sometimes,” (31.8%; n=14), or they “usually do this” (22.7%; n=10), indicating they were in the early or late action stage, respectively. One out of every five men (20.5%; n=5) indicated they “feel ready to start,” indicating they are in the preparation stage. Among females, the largest percentage reported they “sometimes do this” (28.2%; n=50) or they “usually do this” (26.6%; n=30), indicating they were in the early action or late action stage, respectively. There was no difference in the Stage of Change category by gender with regard to the participants’ ability to eat whole grain products every day ( $X^2=4.889$ ;  $p=0.558$ ).

#### Able to get 30 minutes of some type of aerobic activity 5 times a week

In response to the statement, “I am able to get 30 minutes of some type of aerobic activity 5 times a week,” the largest percentage of participants reported they “I usually do this now” (22.8%; n=53) or they “feel ready to start” (20.7%; n=48), indicating they were in the early action or the preparation stage, respectively. Slightly fewer (13.4%; n=31) reported they “think about it, but don’t do it,” indicating they were in the contemplation stage with regard to exercising five times a week (Table 12).

By gender, when responding to the statement “I am able to get 30 minutes of some type of aerobic activity 5 times a week,” the largest percentage of men reported they “do it sometimes,” (25.0%; n=11), or they “usually do it now” (20.5%; n=9), indicating they were in the early or late action stage, respectively. Almost one out of every five men (18.2%; n=8) indicated they “feel ready to start,” indicating they are in the preparation stage. Among females, the largest percentage reported they “usually do it now” (23.4%; n=44) or they “feel ready to start” (21.3%; n=40), indicating they were in the late action or preparation stage, respectively. There was no difference in the Stage of Change category by gender with regard to the participants’ ability to exercise at least 30 minutes 5 days a week ( $X^2=6.412$ ;  $p=0.379$ ).

## **Summary**

Overall, 232 participants completed the Nutrition Assessment Lab Questionnaire (NAL-Q). The majority of participants were white females. The mean BMI was  $29.1 \pm 7.1$ , with over half of the participants classified as overweight or obese (67.6%; n=123). Participants’ mean HDL cholesterol, and LDL cholesterol levels, along with the TC/HDL ratio, were not within optimal ranges. Most participants came to the NAL to lose weight (65.1%; n=151) and improve their overall diet (56.9%; n=132). The largest percentage of participants indicated they exercised 3-4 days per week, rarely smoked, never used tobacco, and had stayed at their current weight over the previous few months. The most prevalent self-reported health conditions were high cholesterol (25.9%; n=60) and high blood pressure (18.1%; n=42). The largest percentage of participants reported eating two servings of fruits and vegetables per day, eating low-fat dairy products once per day, and eating whole grain products once per day. The majority of the participants were in the early or late action stage for six of the seven health and nutrition habits.

In contrast, the greatest proportion of participants were in the “preparation stage” with regard to their ability to lose weight. Overall, these results show that many individuals who seek services with the Nutrition Assessment Lab have poor health and nutrition characteristics. However, many are ready to make lifestyle changes or have already begun to, based on the Stages of Change results. These results indicate a need for continued worksite wellness programs to help participants identify and tackle their independent wellness issues.

## **CHAPTER 5**

### **DISCUSSION**

The purpose of this study was to identify the nutrition and health-related characteristics of faculty and staff at a mid-major university who received services in the Nutrition Assessment Lab, a component of the University's *Working Well* worksite wellness program, between fall semester 2010 and summer semester 2016. This chapter provides a discussion of the results obtained in this study.

#### **RQ#1-a: Demographic Characteristics**

The majority of the participants who came to the Nutrition Assessment Laboratory for nutrition-related services were female (81%). Robroek, van Lenthe, van Empelen, and Burdorf (2009) reported similar results in their comprehensive evaluation of worksite health promotion programs, wherein 12 of the 22 studies included in their systematic review reported significantly more female participants. Only 3 studies in this systematic review reported a significantly higher participation among men (Robroek et al., 2009). In a university-based wellness program described by Butler, Clark, Burlis, Castillo, and Racette (2015), 85% of employees who enrolled were female. Cowdery, Suggs, and Parker (2007) reported that among university employees who chose to participate in a web-based health assessment, 82.2% were female. These results are comparable to the gender distribution of the current study. In the present study, male participants

may have had less involvement with the NAL due to feeling self-sufficient or lacking interest in making dietary changes.

The mean age of NAL participants was  $44.1 \pm 12.8$  years. This is similar to a university-based wellness program discussed by Cowdery et al. (2007) in which the mean age was 45 years. Robroek et al. (2009) found contradictory results for age and participation level, with some studies reporting significantly higher and others significantly lower levels among older employees. Robroek et al. (2009) does note a trend with higher participation among younger employees, and lowest participation level among the oldest age group.

The racial distribution of participants who received services in the Nutrition Assessment Lab was similar to that of all employees at this mid-major Midwestern University. Data obtained from the Ball State University Human Resources department indicated that in 2015, 89.2% of employees were white, similar to the results of the present study (86.5% of NAL participants wear white) (Marc Woods, personal communication, October 3, 2016). The NAL participants indicated black (5.4%), Asian (3.6%), Hispanic (3.2%), and other (1.4%), similar to the representation of employees at the university (i.e., 4.0% black, 3.0% Asian, 2.0% Hispanic, and 1.5% other) (Marc Woods, personal communication, October 3, 2016). In a university-based wellness program described by Butler et al. (2015), 90% of enrolled participants were white, followed by 8% black, and 2% other. In a university-based wellness program discussed by Cowdery et al. (2007), 86.75 were white, followed by 5.6% African American, 2.2% Asian, 2.2% Hispanic, and 3.3% multiracial.

The job code classifications at Ball State University indicated the largest percentage of participants in the present study were professionals (27.3%), followed by professors (25%), staff (24.6%), service (8.2%), and spouses (7.8%). Ball State currently has four primary types of

employees: 1) service (e.g., dining cashiers, custodians, and landscape positions); 2) staff (e.g., administrative coordinators and secretaries), and 3) professional (e.g., assistant/associate director, director, vice president, academic advisor, dean), and 4) faculty (e.g., professor, associate professor, adjunct professor, instructor) (Susan Schlensker, personal communication, October 5, 2016). In a systematic review by Robroek et al. (2009) there was a statistically significant association between higher participation and full-time workers and white-collar workers compared to blue-collar workers. There was a lower participation for swing shift and night shift workers compared to day shift workers (Robroek et al., 2009). Lower participation by service and shift workers may be related to having a less flexible schedule.

### Summary

The majority of NAL participants were females, which is consistent with other reports of worksite wellness programs. Nearly 90% of participants were white; the racial demographic of NAL participants was very similar to the racial distribution of this university overall. Over half of NAL participants were professionals or professors and this indicates that the NAL should focus efforts on engaging with service employees.

### **RQ#1-b: Anthropometric Measures**

In the present study, a BMI was able to be calculated for 182 of the 232 (78.4%) participants. Using this BMI data, 67.5% of the participants were classified as overweight (30.7%; BMI 25.0–29.9) or obese (36.8%; BMI  $\geq$ 30). These findings are similar to 2013-2014 NHANES data that indicated 70.1% of U.S. adults between the ages of 20 and 74 years are overweight (31.9%) or obese (38.2%), with 8.1% of these individuals classified as extremely



obese (Frayar et al., 2016). Among adults age 40-59, 41.0% (Men: 37.2%: Women: 44.6%) are obese (BMI  $\geq 30$ ) (Frayar et al., 2016).

Among males in the present study, 37.5% were overweight and 35% were obese. This is similar to 2013-2014 NHANES data which found that 38.2% of men 20-74 years of age were overweight and 35.5% were obese (Frayar et al., 2016). Among females in the present study, 28.9% were overweight and 37.3% were obese. These results are reflective of the 2013-2014 NHANES that found that 25.8% of women 20-74 years of age were overweight and 41.0% were obese.

While NHANES data indicates the prevalence of overweight individuals 20 years of age and older has remained stable over the past 26 years, ranging from 33.1% in 1988-1994 to 32.5% in 2013-14, the prevalence of obesity among this same population has increased tremendously from 22.9% in 1988-1994 to 37.7% in 2013-2014 (Frayar et al., 2016). While state-specific NHANES data is not available, the 2015 Behavioral Risk Factor Surveillance System data estimated that  $66.5\% \pm 1.9$  of adults in Indiana are overweight and obese, ranking Indiana 16<sup>th</sup> in the nation (Trust for America's Health and Robert Wood Johnson Foundation, 2016). These results are similar to the results seen amongst the NAL participants, of whom 67.6% were overweight or obesity. Clearly overweight and obesity is a significant concern in this population; continued nutrition and health strategies are warranted for managing weight and other comorbidities association with elevated BMIs.

Elevated BMIs are associated with higher mortality rates. A review of 57 prospective studies found that mortality was lowest at a BMI of 22.5 to 25 kg/m<sup>2</sup>, after adjustment for age, sex, smoking status, and study (Prospective Studies Collaboration, 2009). Above this range, each 5 kg/m<sup>2</sup> higher BMI was on average associated with about 30% higher overall mortality

(Prospective Studies Collaboration, 2009). Throughout the BMI range from 20-40 kg/m<sup>2</sup>, there was a strong, positive association between BMI and mortality from ischemic heart disease (Prospective Studies Collaboration, 2009). In the upper BMI range of 25-50 kg/m<sup>2</sup>, there was a strong positive association between BMI and mortality from diabetes, non-neoplastic kidney disease, and non-neoplastic liver disease (Prospective Studies Collaboration, 2009).

In the present study, weight was significantly greater in men ( $p < 0.05$ ). This is expected, however, as the men were also significantly taller ( $p < 0.05$ ). The 2011-2014 NHANES data indicated that adult men 20 years of age and older are generally taller than females, with mean height in males of 69.2 inches and mean height in females of 63.6 inches (Fryar, Gu, Ogden, & Flegal, 2016). This NHANES data also indicates that mean weight in males was 195.7 pounds compared to 168.5 pounds in females (Fryar et al., 2016).

The mean body fat percentage among the females in the present study was 36.3%, well above the healthy body fat percentage range of 21-33% for females age 20-39 and above the range of 23-34% for ages 40-59, as outlined by Tanita Body Composition (Tanita Corporation). It must be remembered that the majority of women in the present study came to the NAL to address issues related to weight, suggesting that their body fat would be higher than recommended. According to 1999-2004 NHANES (most recent data), however, the median body fat percentage in females 45 years of age and older is 39.8% - 42.1% (Kelly, Wilson, & Heymsfield, 2009), higher than that seen in the women in the present study. According to the 1999-2004 NHANES, mean body fat percentage in adults age 20 and older was 40.0% in women, as measured by dual-energy X-ray absorptiometry (Li, Ford, Zhao, Balluz, & Giles, 2009), again, higher than what was seen in the females in the present study. Thus, the body fat percentage of NAL participants was actually less than the mean among U.S. adults.

The mean body fat percentage among the male participants in the present study (24.5%) was greater than the standard healthy body fat percentage range of 8-20% for individuals age 20-39 and above the range of 11-22% for males age 40-59 (Tanita Corporation). According to 1999-2004 NHANES (most recent data), the median body fat percentage in males 45 years of age and older is 25.6% - 28.8%, depending on ethnicity (Kelly et al., 2009). According to 1999-2004 NHANES, mean body fat percentage in adults age 20 and older was 28.1% in men, as measured by dual-energy X-ray absorptiometry (Li et al., 2009). Thus, similar to the females seen in the NAL, the body fat percentage of male NAL participants was slightly less than the median percent body fat seen among U.S. adults. In the present study, females had a significantly higher percent body fat than males. This is consistent with previous finding that mean body fat percentage was significantly different between men and women (Li et al., 2009).

### Summary

The prevalence of overweight and obesity among NAL participants is over two-thirds, which is similar to the prevalence among adults in Indiana. The mean body fat percentage of male and female participants is above the healthy range and corresponds to the mean body fat percentage of U.S. adults overall. Since overweight and obesity are risk factors for multiple conditions, the NAL should continue to offer services to help individuals achieve and maintain a healthy weight.

### **RQ#1-c: Biochemical Measures**

When appropriate, 5 biochemical measures (total cholesterol, LDL cholesterol, triglycerides, HDL cholesterol, and blood glucose) were measured in the Nutrition Assessment Lab. The results will be discussed herein.

The National Institute of Health provides current clinical practice guidelines for lipid panel and blood glucose values according to the Adult Treatment Panel (ATP) III Classification (National Institute of Health, 2001). The NIH reference values for total cholesterol, LDL cholesterol, triglycerides, and HDL cholesterol provide an optimal or desirable category and various classes for borderline high and high values. The American Diabetes Association (2009) provides classifications for fasting plasma glucose.

### Total Cholesterol

Current Adult Treatment Panel (ATP) III classifications for total cholesterol levels include the three categories of “Desirable” (less than 200 mg/dL), “Borderline High” (200-239 mg/dL) and “High” (greater than or equal to 240 mg/dL) (National Institute of Health, 2001). The mean total cholesterol of NAL participants was  $194.8 \pm 42.1$  mg/dL, classified as desirable. Data from the 2013-2014 NHANES indicated a mean total cholesterol of 189 mg/dL in U.S. adults (Rosinger, Carroll, Lacher, & Ogden, 2016). Over half (56.9%) of the participants in the present study had desirable total cholesterol, 28.4% had borderline-high cholesterol and 14.7% had high cholesterol. These results reflect the data from the 2011-2014 NHANES that reported approximately 12% of adults had high total cholesterol ( $\geq 240$  mg/dL) (Carroll, Frayar, et al., 2015). According to the 2015 Indiana Behavioral Risk Factor Surveillance System (BRFSS), 39.1% of adults in the state have had their blood cholesterol levels checked and were been told it was high (CDC, 2015).

In the present study, the NAL-questionnaire asked participants to indicate their health conditions. One option was high cholesterol. Of the 44 participants who had high total cholesterol, 54.5% of them did not indicate they had high cholesterol on the NAL-Q. It is not possible to determine whether they knew about their high cholesterol and chose not to mark the

condition or if they truly did not know they had high cholesterol. Data from the 2015 Indiana BRFSS indicates 4.2% of adults in Indiana have not had their cholesterol checked within the past five years and an additional 22.3% have never had their cholesterol checked (CDC, 2015).

These results indicate that the NAL should continue to offer free lipid panel assessments, as part of a biometric screening, to employees in order to increase awareness of elevated cholesterol levels and refer them to their primary care physician. In addition, consideration should be given for the development of a follow-up plan for those with high levels.

### LDL Cholesterol

The National Institute of Health's Adult Treatment Panel (ATP) III Classification provides guidelines for LDL cholesterol (National Institute of Health, 2001). The ATP III classification for LDL cholesterol (mg/dL) includes: <100 Optimal, 100-129 Above Optimal, 130-159 Borderline High, 160-189 High, and  $\geq 190$  Very High (National Institute of Health, 2001). The mean LDL cholesterol among NAL participants in the present study was  $119.6 \pm 37.5$  mg/dL, falling above the ATP-III classification of optimal LDL cholesterol. This level is also higher than the mean level of 111 mg/dL seen in US adults in the 2013-2014 NHANES (Rosinger et al., 2016). Thirty-nine of the NAL participants (44.3%) had LDL cholesterol classified in the borderline high category or above ( $LDL \geq 130$  mg/dL). This rate is higher than seen in the 2011-14 NHANES, which indicated that 30.3% of U.S. adults had elevated LDL-cholesterol ( $LDL \geq 130$  mg/dL) (Benjamin et al., 2017). In this study, LDL cholesterol levels were significantly ( $p = 0.045$ ) higher among males, with the mean LDL 19.4 mg/dL greater than in females (Males:  $M = 134.8 \pm 34.2$ ; Females:  $M = 115.4 \pm 37.5$ ).

## Triglycerides

ATP III classification of serum triglycerides (mg/dL) are <150 Normal, 150-199 Borderline High, 200-499 High, and  $\geq 500$  Very High (National Institute of Health, 2001). In the present study, the mean triglyceride level was  $144.2 \text{ mg/dL} \pm 98.6$ . Among U.S. adults aged 20 years and older, the 2013-2014 NHANES results indicated a mean triglyceride level of 97 mg/dL (Rosinger et al., 2016). Over two-thirds (69.5%) of the NAL participants had optimal triglyceride levels. Twenty-nine participants (30.5%) had measured triglyceride levels in the borderline high category or above ( $\geq 150 \text{ mg/dL}$ ). The results seen in the NAL are similar to those reported in the 2009-12 NHANES where 25.1% of adults in America had high triglyceride levels ( $\geq 150 \text{ mg/dL}$ ) (Carroll, Kit, & Lacher, 2015).

In the present study, the NAL-questionnaire asked participants to indicate their health conditions. One option was high triglycerides. Of the 29 participants who had borderline high or high triglycerides ( $\geq 150 \text{ mg/dL}$ ), 24 (83%) did not mark or did not know they had high triglycerides, as gathered from the NAL-Q. It is not possible to determine whether they knew about their high triglyceride and chose not to mark the condition or if they truly did not know they had high triglycerides. This indicates that affordable and easily accessible triglyceride screening tests are valuable to employees in order to increase awareness of elevated triglycerides.

## HDL Cholesterol

In contrast to most lipid measures, a low HDL cholesterol reading is considered a health risk, while a 'high' HDL cholesterol is associated with a reduced risk (Carroll, Frayar, et al., 2015; Mozaffarian et al., 2014). According to the ATP III classifications, a low HDL is <40 mg/dL, while a high HDL is  $\geq 60 \text{ mg/dL}$  (National Institute of Health, 2001). In the present

study, the HDL level among the NAL participants was  $51.5 \pm 16.4$  mg/dL. This is similar to that seen in the 2011-14 NHANES where the mean HDL level was 52.9 mg/dL in adults (Benjamin et al., 2017).

The largest percentage (49.0%) of NAL participants had HDL levels in the normal range. Overall, 22% had low HDL levels (Males: 36.8%; Females: 18.5%). This is similar to 2011-14 NHANES where 18.7% of adults overall had low HDL cholesterol (Carroll, Frayar, et al., 2015). By gender, the mean HDL in the present study was significantly greater in females ( $53.5 \pm 16.9$  mg/dL) than males ( $42.8 \pm 10.4$  mg/dL). This finding is similar to that seen in the 2011-2014 NHANES where the percentage of women with low HDL cholesterol (10.0%) was consistently lower than the percentage of men (27.9%) with low HDL, in each age group (Carroll, Frayar, et al., 2015). High density lipoprotein was higher in females among all racial classifications (Benjamin et al., 2017) and this has been observed in many previous studies (Davis et al., 1996)

#### Blood Glucose

According to the American Diabetes Association (2009), a normal fasting glucose is  $<100$  mg/dL, impaired fasting glucose (pre-diabetes) is 100 -125 mg/dL, and diabetes is  $\geq 126$  mg/dL. In the present study, the mean fasting blood glucose ( $90.5 \pm 12.7$ ) of NAL participants was within the normal range, with 80.9% of participants having optimal blood glucose. Impaired glucose tolerance was seen in 8.1% of the NAL participants. This is less than 2011-12 NHANES, in which the unadjusted prevalence of pre-diabetes, using hemoglobin A1c, fasting plasma glucose, or 2-hours plasma glucose, was 38.0%.

The diagnostic point for diabetes is a fasting plasma glucose of  $\geq 126$  mg/dL (American Diabetes Association, 2009). In the present study, only 1.1% met the criteria for diabetes. This is significantly fewer than the 11.9% of adults in the U.S. diagnosed or undiagnosed with diabetes

reported in the 2011-14 NHANES (Burwell et al., 2016). This may be due to the dietary and physical activity habits of NAL participants compared to the national population. In Indiana, 2015 BRFSS data indicates 11.4% of adults have been told they have diabetes (CDC, 2015). Only three of the 17 (18%) participants in the current study who had an impaired fasting glucose indicated they had pre-diabetes on the NAL-Q; whether they did not know they had pre-diabetes or whether they simply did not indicate it on the NAL-Q could not be determined.

The alarming reality is that an estimated 38.0% of people with diabetes are undiagnosed (Menke et al., 2015). According to 2012 data from the National Health Interview Survey of adults aged 18 years and older, 9% of adults in the United States have been told by a health professional that they had diabetes (Adams et al., 2013). The development of diabetes can be slowed or prolonged if interventions are initiated, particularly in those with pre-diabetes.

The NAL-Q measured four of the five parameters used in the diagnose of metabolic syndrome. Metabolic syndrome (MetS) is a term for a cluster of metabolically related risk factors, typically including criteria for waist circumference, HDL cholesterol, triglycerides, blood pressure, and fasting plasma glucose (Alberti, Zimmet, & Shaw, 2006). The National Cholesterol Education (NCEP) ATP III definition of metabolic syndrome occurs when three or more of five components are present: central obesity (determined by waist circumference), elevated triglycerides, reduced HDL cholesterol, elevated blood pressure, and an elevated fasting glucose (Alberti et al., 2006). Using 2011-12 NHANES data, 34.7% of adults met the criteria for MetS (Aguilar, Bhuket, Torres, Liu, & Wong, 2015). If the NAL-Q included the measurement of waist circumference, participants could be informed if they meet the criteria for metabolic syndrome. This would be useful knowledge to participants because there are many adverse health conditions related to metabolic syndrome, including nonalcoholic fatty liver disease,



sexual dysfunction, obstructive sleep apnea, and osteoarthritis (Mozaffarian et al., 2014). Greater awareness of metabolic syndrome and its health consequences can lead to improvements in optimizing treatments of risk factors (Aguilar et al., 2015).

### Summary

The mean total cholesterol, LDL cholesterol, and triglyceride levels in NAL participants was greater than the respective mean among U.S. adults. Furthermore, the percentage of NAL participants with elevated total cholesterol, LDL cholesterol, and triglycerides is greater than the respective percentage in U.S. adults. In addition, the percentage of NAL participants with low HDL cholesterol is greater than that in U.S. adults overall. In contrast, a smaller percentage of NAL participants had impaired fasting glucose or fasting glucose in the range of diabetes compared to the national average. The lipid profile and blood glucose measurements assessed in the Nutrition Assessment Lab are critical indicators in cardiovascular health and metabolic syndrome. The NAL should continue to offer screening services for lipid panels and target programs toward lifestyle modifications for hyperlipidemia.

### **RQ#1-d: Clinical Measures**

Two clinical measures – hypertension and an estimate of bone density – were measured when appropriate in the Nutrition Assessment Lab. The results will be discussed herein.

#### Hypertension

High blood pressure, or hypertension, is defined as a systolic blood pressure (SBP)  $\geq 140$  mm Hg or a diastolic blood pressure (DBP)  $\geq 90$  mm Hg (Mozaffarian et al., 2014). In the present study, the mean systolic blood pressure among NAL participants was  $(121.6 \pm 15.5 \text{ mmHg})$ , slightly higher than the American Heart Association's (AHA) recommended value of less than

120 mm Hg (Mozaffarian et al., 2014). The mean diastolic blood pressure among NAL participants of  $75.2 \pm 11.1$  mmHg was within the AHA recommended diastolic value of less than 80 mg/dL (Mozaffarian & Ludwig, 2015).

In the present study, 50.6% of the NAL participants had a SBP higher than 120 mm Hg and 26.7% had diastolic blood pressure greater (DBP) than 80 mm Hg. Overall, 10.5% of the NAL participants had a SBP  $\geq 140$  mm Hg and 11.6% had DBP  $\geq 90$  mmHg, slightly less than the 2013-14 NHANES data that indicated 30.8% of U.S. adults had hypertension (Burwell et al., 2016). Data from the 2015 Indiana BRFSS indicated nearly one-third (32.4%) of adults had been told they have high blood pressure (CDC, 2015). Furthermore, 2011-14 NHANES indicated that 15.9% of these adults with hypertension were unaware of their status (Burwell et al., 2016)

By gender, females in the present study had significantly greater systolic blood pressures than males ( $p=0.004$ ). This observation contrasted with the 2013-14 NHANES, which indicated that overall, the age-adjusted percentage of adult men (31.0%) and women (29.7%) with hypertension was similar (Burwell et al., 2016). However, until 45 years of age, a higher percentage of men than women have hypertension (Mozaffarian et al., 2014). From 45 to 64 years of age, the percentage of men and women with hypertension is similar and then after 64, the percentage is higher in women (Mozaffarian et al., 2014).

In the present study, of the 46 participants with elevated blood pressure, 11 males (73.3%) and 23 females (74.2%) did not mark or did not know they had high blood pressure when completing the health conditions portion of the NAL-Q. However, whether they did not know they had high blood pressure or whether they simply did not indicate it on the NAL-Q could not be determined. In the United States, data from the 2011-2012 NHANES indicated that

among adults with hypertension, 17.3% of adults are not aware of their hypertension (Nwankwo, Yoon, Burt, & Gu, 2013).

### Bone Density

The National Osteoporosis Foundation (2016) states that a bone density screening test can help identify people who are likely to benefit from further bone density testing, however it cannot accurately diagnose osteoporosis. Typically, results of a bone density scan are given as a T-score, which compares a client's bone density to the ideal bone density of a healthy 30-year old (NIH Osteoporosis and Related Bone Diseases, 2015). With devices such as the Sunlight Omnisense used in the NAL, a T-score of -1.0 or above is normal bone density, while a T-score between -1 and -2.5 indicates low bone density, and a T-score of -2.5 or below indicates osteoporosis (National Osteoporosis Foundation, 2016). The mean T-score in the present study was  $-0.83 \pm 1.1$ , which falls into normal bone density range. Based on a bone mineral density of the femur neck region or the lumbar spine, 9% of older adults aged 50 years and over have osteoporosis and nearly half (49%) have low bone mass (Looker, Borrud, Dawson-Hughes, Shepherd, & Wright, 2012).

Bone density tests or screenings may also include a Z-score. A Z-score compares an individual's bone density to what is normal for someone in that same age category and body size (National Osteoporosis Foundation, 2016). According to the International Society for Clinical Densitometry (2015), a Z-score of -2.0 or above is considered to be within the expected range for age. The mean Z-score among NAL participants was  $-0.32 \pm 0.94$ , which classified in the normal range. T-scores are the preferred reporting measure in postmenopausal women and in men age 50 and older (International Society for Clinical Densitometry, 2015).

## Summary

The percentage of NAL participants with elevated systolic blood pressure and diastolic blood pressure were less than the national average indicated in current NHANES reports. Many adults are not aware they have hypertension and regular screenings with the NAL can alert employees of their current blood pressure and provide guidance for lifestyle modifications and appropriate health care resources. The mean bone density T-scores and Z-scores fell within the normal range.

### **RQ#2-a: Health-Related Conditions**

When the participants come to the NAL for the first time, they are asked to indicate what reasons motivated them to make an appointment to receive nutrition assessment, counseling, and education, or biometric screening services. The majority of participants indicated they came to the NAL to “lose weight” (65.1%) and to “improve their overall diet” (56.9%). A 2015 Gallup poll of 1,021 randomly selected adults, indicated 49% of the respondents wanted to lose weight (McCarthy, 2015). However, the Gallup poll also reported that, of these 49%, only 24% are seriously working toward that goal (McCarthy, 2015). The 2000 BRFSS found the prevalence of trying to lose weight was 46% in women and 33% in men (Bish et al., 2005). Additional responses on the NAL included: to “have more energy” (37.1%), to “learn more about diet/exercise” (35.3%), to start a “diet/exercise routine” (34.1%), and to “lower cholesterol” (28.0%).

Interestingly, the percentage of participants who indicated they came to the NAL to “lower cholesterol” (28%) was lower than the percentage of participants who actually had borderline high/high LDL (44.3%) or borderline high/high total cholesterol (43.1%). Findings

from the Fronstin, Employee Benefit Research Institute, and Roebuck (2015) survey found that the major reason (45%) for participating in employers' wellness programs was "to improve health." Other major reasons for participating in an employers' wellness program as reported by Fronstin et al. (2015) included "to maintain current health status" (32%), because they "offered incentive prizes" (33%), "reduce premiums" (31%), and "to learn more about own health risks" (31%).

### Summary

The most prevalent factors why participants utilized the NAL was in order to lose weight and improve their overall diet. This is as expected considering the current health status of NAL participants and the prevalence of overweight and obesity. Through nutrition counseling and education, the NAL can meet participants' needs and interests.

### **RQ#2-b: Health-Related Programs Desired**

About half of the respondents in the present study indicated they were interested in menu planning advice (Males: 50%; Females: 56.4%) and healthy eating discussions (Males: 50%; Females: 47.9%). Nearly one-quarter were interested in weight loss competitions (Males: 25%; Females: 21.3%). Worksite weight-management programs have been increasing across the United States and may be effective methods of reducing BMI (Ausburn, LaCoursiere, Crouter, & McKay, 2014). Group education settings can be effective for reducing weight, increasing physical activity, and improving diet (Ausburn et al., 2014). Rigsby, Gropper, and Gropper (2009) found that participation in a group had greater changes in BMI compared to participants who received individual counseling.

## Summary

Nearly half of NAL participants are interested in menu planning advice and/or healthy eating discussions. The NAL has included programs that address menu planning, healthy eating, and weight loss and this aligns with the programs that interest participants. The NAL may be most successful and utilized through offering both individual and group education services.

### **RQ#3: Health Habits and Conditions**

#### Physical Activity

The NAL-Q included a question about the frequency and duration of weekly physical activity in which the participant engaged, if applicable. Results indicated that 37.1% participated in physical activity 3-4 days per week and 28.9% participated 5-7 days per week. The 2008 federal guidelines recommend adults perform at least 150 minutes a week of moderate-intensity physical activity or 75 minutes a week of vigorous-intensity aerobic physical activity (U.S. Department of Health and Human Services, 2008). According to the 2014 National Health Interview Survey, only 49.2% (95% CI, 48.21-50.24) percent of adults met this requirement (CDC/NCHS, 2015). Based on the NAL-Q, it can not be determined how many participants are meeting the physical activity guidelines, however the results do indicate that at least one-third of participants are not meeting the guidelines.

The mean duration of physical activity among participants in the present study who engaged in physical activity was  $42.9 \pm 23.1$  minutes. Tucker, Welk, and Beyler (2011) examined physical activity data from NHANES 2005-2006 and found a difference in minutes of physical activity per day between self-reported amounts and that measured by accelerometer. Among U.S. adults, mean self-reported physical activity was  $324.5 \pm 18.6$  minutes/week of moderate physical

activity and  $73.6 \pm 3.9$  minutes/week of vigorous physical activity. However, measured accelerometer physical activity estimates were  $45.1 \pm 4.6$  minutes/week of moderate physical activity and  $18.6 \pm 6.6$  minutes/week of vigorous physical activity. According to the accelerometer data, less than 10% of U.S. adult met the Physical Activity Guidelines for Americans (Tucker et al., 2011). According to Vital and Health Statistics report, 2013, men (50.4%) were more likely than women (41.1%) to meet the guidelines for aerobic physical activity (Schoeborn, Adams, & Peregoy, 2013). Butler et al. (2015) found improvements in physical activity, measured by step counts, after participation in a eight-week worksite wellness program. Based on the accuracy of self-reported physical activity in other studies, it is reasonable to predict that NAL participants are participating in physical activity less frequently than reported, and therefore are even further away from meeting the guidelines. Overall, NAL participants are not engaging in adequate amounts of physical activity, similar to the current trend in the U.S.

### Alcohol Consumption

Almost half of the NAL participants (41.8%) indicated ‘rarely’ consuming alcoholic beverages, with another one-third (30.6%) indicating they ‘never’ consume alcohol. Approximately one out of every five participants (17.7%) reported consuming alcohol ‘weekly’ while 3.0% indicated they consume ‘daily.’ Data from the 2008-2010 Vital and Health Statistics (most recent) reported similar findings, with 29.2% of men and 40.5% of women identifying as nondrinkers (no drinks in the past year), 10% of men and 16.6% of women as infrequent drinkers (1-11 drinks in the past year), and 31.9% of men and 29.5% of women as light drinkers (3 drinks or less per week) (Schoeborn et al., 2013). The 2015 Dietary Guidelines for Americans (DGA) recommend that, if alcohol is consumed, it should be consumed in moderation, with moderation

defined as up to one drink per day for women and up to two drinks per day for men (U.S. Department of Health and Human Services and U.S. Department of Agriculture, December 2015).

According to the 2014 National Survey of Drug Use and Health, 56.5% of people 26 years of age and older reported they drank alcohol in the past month (Hedden, Kennet, Lipari, Medley, & Tice, 2015). In Indiana, 2015 BRFSS data indicated 49.4% of adults have had a least one drink of alcohol in the past 30 days (CDC, 2015). Data from 2003-06 NHANES indicated that, on a given day, an estimated 33% of men and 17% of women consumed some amount of an alcoholic beverage (Guenther, Bowman, & Goldman, 2010). Of those who drank alcohol at least once over the past year, about half had an average alcoholic beverage intake on drinking days that exceeded the daily limits of the DGA; that is 47% of male drinkers drank an average of more than 2 drinks per day and 57% of females consumed more than one (Guenther et al., 2010). Men (70.8%) are more likely than women (59.5%) to be current drinkers (Schoeborn et al., 2013). The Dietary Guidelines recommends that if alcohol is consumed, the amount of calories it provides should be accounted for so that the limit on calories is not exceeded (U.S. Department of Health and Human Services and U.S. Department of Agriculture, December 2015). Among those who consume alcoholic beverages, the percent of total energy in the diet from alcohol was 8.1% for men and 4.6% for women (Guenther et al., 2010).

### Tobacco Use

Results indicated that only 1.3% of the participants in the NAL currently use tobacco (i.e., cigarettes, cigars, or chew smokeless tobacco), significantly lower than reported by the 2015 National Health Interview Survey (NHIS) data that indicated 16.7% of men and 13.7% of women were current cigarette smokers. In a university-based health risk assessment by Cowdery



et al. (2007), 11.1% of participants identified as current smokers. In the present study, 78.0% indicated they have never used tobacco products, similar to the 2015 NHIS report of 64.0% of individuals who have never smoked. In the present study, 10.8% used to use tobacco products compared to the NHIS results that indicated 20.8% were former smokers (National Center for Health Statistics, 2015). According to Vital and Health Statistics report, 2013, men (22.4%) were more likely than women (18.0%) to be current smokers (Schoeborn et al., 2013). In Indiana, the 2015 BRFSS data indicated 16.9% of adults smoke every day, 6.0% smoke some days, 24.1% were former smokers, and 53.0% reported never having smoked (CDC, 2015).

### Weight Changes

Self-reported weight changes in the present study indicated 24.1% lost weight (either intentional or unintentional) and 28.9% gained weight. This is comparable to data from the 2008 and 2009 Behavioral Risk Factor Surveillance System (BRFSS), in which 25.8% of adults reported losing weight and 26.8% reported gaining weight over this one year period (Wetmore & Mokdad, 2012). There can be a discrepancy between calculated and reported changes in body weight. The prevalence of obesity increased during the study period (2008 to 2009) however, Americans reported weight loss (Wetmore & Mokdad, 2012). This indicates that self-reported weight changes should be interpreted with caution (Wetmore & Mokdad, 2012). BRFSS data found the odds of weight gain were higher for current and former smokers, those consuming less than five servings of fruits and vegetables per day, those reporting no physical activity, and those lacking health care coverage, among others (Wetmore & Mokdad, 2012).

### Self-perceived Health

The NAL-Q addressed self-perceived health (also called self-rated health or self-assessed health) and this type of question is widely used in surveys, disease risk screenings, and clinical

trials (Jylhä, 2009). In the present study, over two-thirds (69.0%) of participants rated their health as “very good” (16.8%) or “good,” (52.2%). One out of every four participants indicated their health was ‘fair’ (26.3%), followed by 3.9% as “poor” and 0.4% as “very poor.” In the 2015 National Health Interview Survey, respondent-assessed health status reported among individuals 45-64 years was 23.1% “excellent,” 31.7% “very good,” 29.1% “good,” 12.0% “fair,” and 4.0% “poor” (Lucas & Benson, 2015). Fewer NAL participants indicated their health status as “poor” or “very poor” compared to the NHIS data. In Indiana, 2015 BRFSS data indicated 48.4% rated their general health as “excellent” or “very good,” which is a higher percentage than among NAL participants (CDC, 2015). Furthermore, 32.8% of individuals in Indiana indicated their general health as “good,” 13.5% as “fair,” and 5.4% as “poor” (CDC, 2015). A larger percentage of NAL participants indicated their health as “fair” compared with data from Indiana, however a similar percent their health as “poor.”

Numerous studies have found a strong and constant association of self-rated health, which is an individual and subjective measure, and mortality (Jylhä, 2009). When other factors, such as health indicators, are controlled for, the association attenuates, but seldom disappears and seems to be universal in all populations studied (Jylhä, 2009). Jylhä (2009) states that the self-rated health question is a useful and convenient tool and can serve as a “screening” tool for patients’ health status.

### Health Conditions

The most prevalent self-reported health condition on the NAL-Q was high cholesterol (25.9%). According to 2011-14 NHANES, 39.7% (Males: 37.0%; Females: 42.0%) of adults 20 years of age or older in the United States have total cholesterol levels greater than 200 mg/dL, with 11.9% (Males: 10.6%; Females: 13.0%) having total cholesterol levels greater than 240

mg/dL (Benjamin et al., 2017). According to the 2015 BRFSS, 39.1% of adults in Indiana have had their blood cholesterol checked and have been told it was high (CDC, 2015). In the past five years, 4.0% of adults in Indiana have not had their cholesterol checked and an additional 21.5% have never had their cholesterol checked (CDC, 2015).

In the present study, 18.1% of participants indicated they have high blood pressure, lower than the 24% prevalence reported by the 2012 National Health Information Survey (Adams et al., 2013). The percentage is greater in Indiana; where, according to the 2015 BRFSS data, slightly less than one-third (32.4%) of adults have been told they have high blood pressure (CDC, 2015).

Results of the NAL-Q indicate 6.9% of the participants had diabetes with an additional 11.2% having pre-diabetes. According to NHANES 2011-2012, the unadjusted prevalence of diabetes, using hemoglobin A1c, fasting plasma glucose, or 2-hours plasma glucose, was 14.3%, including 9.1% with diagnosed diabetes and 5.2% for undiagnosed diabetes (Menke et al., 2015). The percentage of individuals diagnosed with diabetes who were seen in the NAL is similar to the results of the 2012 National Health Interview Survey of adults aged 18 years and older, which found that 9% had been told by a health professional that they had diabetes (Adams et al., 2013). The prevalence of pre-diabetes was lower in the present study than other reports. Based on fasting glucose or hemoglobin A1C levels, 38.0% of adults in the U.S. had pre-diabetes, in 2011-2012 (Menke et al., 2015). In the present study, 8.2% of participants reported high triglycerides. This is lower than the 2009-2012 NHANES data that found 25.1% of U.S. adults had high triglycerides (CDC, 2015). Based on the prevalence of various health conditions reported on the NAL-Q, the NAL should focus on high cholesterol (25.9%), high blood pressure (18.1%), and pre-diabetes (11.2%) rather than osteoporosis (5.6%), for instance.

## Summary

Over one-third (34%) of participants are engaging in physical activity two or fewer days per week, indicating at least one-third of participants are not meeting recommendations for physical activity. The majority (72.4%) of participants rarely or never consume alcohol, while only 3.0% consume alcohol daily. Only 1.3% of participants currently use tobacco. In the past few months, 28.9% of participants have gained weight, while 19.4% have lost weight on purpose. In the present study, over two-thirds (69.0%) of participants rated their health as “very good” or “good.” The most prevalent self-reported health conditions on the NAL-Q was high cholesterol (25.9%) and high blood pressure (18.1%). This data suggest that efforts of the NAL should focus on physical activity, weight management, and lifestyle changes to improve cholesterol and high blood pressure.

## **RQ#4. Nutrition Habits**

### Servings of Fruits and Vegetables

In the present study, 93.1% of participants reported consuming fruits and vegetables less than five times per day. This is greater than the Indiana BRFSS 2009 data (the last year in which fruit and vegetable data was collected in the state), which indicated nearly 4 out of 5 adults (79.4%) are consuming fruits and vegetables less than five times per day (CDC, 2015). The largest percentage of participants (29.3%) consumed two servings per day of fruits and vegetables.

Intake of fruits and vegetables is very poor among U.S. adults, according to various sources. According to NHANES 2009-2010, average vegetable consumption ranged from 1.7 to 2.7 servings per day and average fruit consumption ranged from 1.1 to 1.8 servings per day. In

the 2011-12 NHANES, mean daily intake of fruits was 0.99 cup equivalents (whole fruit and fruit juice) per day and mean total vegetable intake was 1.64 cup equivalents, in adults aged 20 and over (U.S. department of Agriculture & Agriculture Research Service, 2014). The average intake of both fruits and vegetables is less than the *2015 Dietary Guidelines for Americans* (DGA) recommendation for 2.5 cups of vegetables and 2 cups of fruit, at the 2,000-calorie level (U.S. Department of Health and Human Services and U.S. Department of Agriculture, December 2015). More than one quarter of adults in Indiana (26.9%) consume vegetables less than one time per day 43.6% consume fruit less than one time per day (CDC, 2015).

#### Servings of Dairy and Type of Dairy Products Purchased

In the present study, in response to the question, “On a typical day, I eat or drink dairy products \_\_\_\_ times per day,” the largest percentage (37.9%) of participants consumed dairy one time per day. Only 14.7% consumed three servings of dairy per day, meeting the recommendations from the DGA (U.S. Department of Health and Human Services and U.S. Department of Agriculture, December 2015). Consumption of dairy products is beneficial in energy restricted diets and increased dairy consumption without energy restriction does not lead to unfavorable weight changes (Abargouei, Janghorbani, Salehi-Marzijarani, & Esmailzadeh, 2012). Combined intake of fermented dairy products (cheese, yogurt, and thick fermented milk) was inversely associated with diabetes (P-linear trend = 0.02) (Sluijs et al., 2012).

#### Servings of Grain Products and Whole Grains

In the present study, the largest percentage of participants consumed grain products 1-2 times per day (48.3%) or 3-4 times per day (31.9%). This is less than results from 2011-12 NHANES, which found the mean daily intake of grains is 6.80-ounce equivalents among U.S. adults age 20 years and over (Bowman, Clemens, Friday, Thoeirig, & Moshfegh, 2014). In

another perspective, over 60% of U.S. met the daily intake recommendations for total grains ( $\geq 6$  oz. eq./d) (Albertson, Reicks, Joshi, & Gugger, 2016).

The DGA 2015 recommends to consume at least half of total grains as whole grains (U.S. Department of Health and Human Services and U.S. Department of Agriculture, December 2015). In the present study, over half (63.4%) of participants consumed whole grain products only once (39.2%) or twice (24.1%) per day. The mean intake of whole grains among U.S. adults is less than the DGA guidelines (Bowman et al., 2014). According to NHANES 2011-2012, the mean intake of whole grains was 0.98 ounce equivalents among U.S. adults, while the intake of refined grains was 5.82 oz. equivalents (Bowman et al., 2014).

In the present study, 9.9% of participants consumed three or more servings of whole grains products per day. Less than 10% of adults are consuming the recommended intake of  $\geq 3$  servings per day of whole grains, according to 2011-12 NHANES (Benjamin et al., 2017). According to Millen et al. (2015), nearly 100 percent of the U.S. population does not meet the goal for whole grain intake, of which the minimum intake ranges from 3- to 4-oz. equivalents. According to Albertson et al. (2016), only 7.9% of adults consumed the recommended amount of whole grains in 2011-2012, based on 2-day food records. Whole grain intake of  $\geq 1$  oz. equivalent per day was associated with an increased intake of shortfall nutrients (vitamin A, vitamin D, vitamin E, folate, vitamin C, calcium, magnesium) (Albertson et al., 2016). Albertson et al. (2016) found a significant, inverse relationship between BMI and waist circumference and whole grain intake in adults.

### Limiting Fat in the Diet

The NAL-Q asked participants if they try to limit the amount of fat in their diet. Compared to previous Dietary Guidelines, the 2015 DGA does not list total fat as a nutrient of

concern nor proposes restricting its consumption (Mozaffarian & Ludwig, 2015). However, the 2015 DGA do clearly recognize that saturated fat is overconsumed in the U.S. population and recommends intake of less than 10 percent of total calories per day (U.S. Department of Health and Human Services and U.S. Department of Agriculture, December 2015). The DGA recommends replacing saturated fat with unsaturated fat, particularly polyunsaturated fatty acids. The Dietary Guidelines Advisory Committee (DGAC) scientific report also recommends replacing solid animal fats with non-tropical vegetable oils and nuts (Millen et al., 2015). The DGAC report states that “dietary advice should put the emphasis on optimizing types of dietary fat and not reducing total fat” (Millen et al., 2015).

In the present study, 30.2% of participants indicated limiting fat in their diet all the time and 55.2% sometimes limit fat. This is higher than results from the 2014 Gallup Consumption Habits survey which found that 56% of Americans are trying to avoid fat in their diet, while 22% include fat, and 21% don’t think about it (Dugan, 2014).

#### Using Food Labels

In the present study, 81.9% of participants responded using the food labels either all the time or sometimes when choosing food items and there was no difference by gender. Todd (2014) found that among working adults, 42% reported using the Nutrition Facts Panel some or all of the time when shopping for food. From a systematic review by Campos, Doxey, and Hammond (2011), 75% of the general population in the U.S. use nutrition labels in some capacity and women reported using labels more frequently than men did. There are associations between individuals who report greater use of nutrition labels and those who have healthier eating habits, are more concerned with dietary guidelines, have more nutrition knowledge, are controlling weight, and have a diagnosis of a disease (Campos et al., 2011). Observational

studies have found an association between use of nutrition labels and healthier diets; lower fat, sodium, and cholesterol consumption; and increased fiber, iron, and vitamin C (Campos et al., 2011).

### Nutrient Supplements

In the present study, 41.4% of participants reported taking nutrient supplements daily. This is similar to Bailey, Gahche, Miller, Thomas, and Dwyer (2013) who found that nearly half (49%) of adults reported using a dietary supplement product within the past 30 days. Bailey et al. (2013) found that nearly half of adults reported using a dietary supplement within the past 30 days, of which multivitamins were the most common. In the present study, there was no difference by gender (men=40.9%; women=41.4%) who reported taking nutrient supplements. This is inconsistent with Bailey et al. (2013) who found more women (54.4%) than men (43.1%) took dietary supplements.

Bailey et al. (2013) found that the most common reasons that adults reported using dietary supplements were to “improve overall health” (45%) and to “maintain health” (33%). Data from 2007-10 NHANES found that the most common type of dietary supplement was multivitamins, which individuals took to “maintain health” or to “supplement the diet” Bailey et al. (2013). Among U.S. adults, the second most common supplement was calcium (11.6%) followed by omega-3’s/fish oil (9.8%). Bailey et al. (2013) found that of the supplements taken, less than one-quarter (23%) were based on the advice of a health care professional.

### Summary

The majority of NAL participants are not meeting current recommendations for dietary intake for fruits and vegetables, dairy, and whole grains. More than nine of ten NAL participants are not meeting recommendations for fruit and vegetables, as evidenced by reporting consuming



less than five servings of fruit and vegetables per day. Only 14.7% consumed three servings of dairy products per day, which is the recommendation from the Dietary Guidelines. Less than 10% are consuming the recommended intake of whole grains, three or more servings per day. Nearly one-third of participants always try to limit fat in their diet, nearly 82% use food labels, and nearly 42% take nutrient supplements daily. Due to the association between poor dietary habits and incidence of chronic diseases, the NAL should continue efforts aimed at enhancing nutrition knowledge and behavior change in employees.

## **RQ#5. Stages of Change**

### Stages of Change

The NAL-Q addressed participants' Stage of Change for seven nutrition and health behaviors. The six statements of readiness on the NAL-Q correspond with the Stages of Change model, including pre-contemplation, contemplation, preparation, early-action, late-action, and maintenance.

Glanz et al. (1998) found that individuals who are in the later stages of change for dietary behaviors show a trend toward greater participation in nutrition interventions. Similarly, Spencer, Wharton, Moyle, and Adams (2007) discusses how there is a relationship between later stages in the model, such as preparation, action, and maintenance, and a greater focus on health and health-related behaviors. Individuals in the pre-contemplation stage ("I don't do and I don't think about it") are unaware of the need for change are typically uninterested in change (Glanz et al., 1998). In a review of 21 population studies, the Stages of Change construct was effective in describing measured dietary intake or food-related habits.

The first statement, “I don’t do and I don’t think about it” correlates with the first stage, pre-contemplation, in which “an individual may or may not be aware that a behavior change is needed and has no intention of changing in the next six months” (Spencer et al., 2007). For six of the seven health and nutrition behaviors, the percentage of participants in the pre-contemplation stage was less than 8%. For the nutrition behavior that addressed the intake of non-fat dairy products, 15.5% were in pre-contemplation. This may be because individuals who are not consuming non-fat dairy may be avoiding them due to a dislike or lactose-intolerance. Individuals in the pre-contemplation stage are not ready for behavior change, however an appropriate intervention may simply focus on increasing the awareness of the need to change (Molaison, 2002).

The percentage of individuals in the contemplation stage for the seven nutrition and health habits ranges from 6.0 to 13.4%. Individuals in the contemplation stage are also not ready for behavior change, and therefore the concentration should be on addressing possible barriers (Molaison, 2002). The low percentages of participants in the pre-contemplation and contemplation stage in the present study supports the theory that individuals in these stages are not aware or interested in seeking guidance for change, and thus not seeking out the services of the NAL.

The largest percentage of participants were in the preparation stage (34.9%) for weight loss. This was the only behavior in which the largest percentage of participants were in the preparation stage. This indicates that those who are ready to focus on weight loss are seeking the services of the NAL, whereas those who are not interested in weight loss or who have already been successful are not. In the preparation stage, the intervention should encourage a switch from thinking about change to actually changing the behavior (Molaison, 2002). In addition, the health

educator or clinician working with the client should discuss reasonable lifestyle changes. Only 1.7% of participants are in the maintenance stage for weight loss, indicating that those who have already made and maintained change are not seeking services with the NAL.

For three of the seven health behaviors (improving types of healthy food, servings of vegetables, and whole grains) the majority of the participants were in the early-action stage. For two of the health behaviors (servings of fruit and physical activity) the majority of participants were in the late-action stage. In regards to nonfat dairy products, there was an equal percentage of participants in the early-action and late-action stage.

Among NAL participants, 38.8% indicated consuming 2-3 servings of fruit per day as “usually” or “all the time” do this. Nearly half of participants (47.9%) are in the preparation or early-action stage for consuming 2-3 servings of fruit per day. This is the segment of the population where intervention efforts should be focused. Spencer et al. (2007) indicates that studies show a consistent pattern of increases in fruit and vegetable intake across the stages of change. Evidence is present that dietary behavior interventions based on participants’ stage of change can be an effective model (Spencer et al., 2007).

Overall, this indicates that participants are coming to the Nutrition Assessment Lab ready to make changes. The results of the NAL participants’ Stage of Change confirm the theory that individuals who are in the pre-action or action stage will seek information and engage in behavior change activities. The NAL can focus on addressing individuals in the action stage while also provide continued support for individuals in the maintenance stage. The NAL needs to have a stronger focus on moving participants from their current stage of change, for the identified issue, to the next stage. Further follow-up data collected from participants returning to

the NAL should be gathered in order to evaluate their progress and the effectiveness of the NAL services.

### Summary

The data collected in the NAL-Q can be utilized by program planners to identify areas of concern within the population at this university. It can also be used to evaluate current programs and potentially develop new programs. For example, data from this population would suggest that efforts should be focused on weight management (67.5% overweight based on BMI) rather than tobacco use (1.3% current tobacco use) or alcohol intake (1.3% consume alcohol daily).

### **Summary**

In summary, the results of this study indicated the health and nutrition characteristics of NAL participants are suboptimal. The biochemical and clinical lab results are similar to those seen in nationwide studies. The behaviors, including both nutrition and physical activity, of participants need improvement. The stages of change of NAL participants is consistent with previous data indicating they seeking information and ready to make behavior change.

## **CHAPTER 6**

### **CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH**

The purpose of this study is to identify the nutrition and health-related characteristics of faculty and staff at a mid-major university who received services in the Nutrition Assessment Lab, a component of the *Working Well* worksite wellness program, between fall semester 2010 and summer semester 2016. This chapter summarizes the results, identifies the study's limitations, and presents ideas for future research.

#### **Conclusions**

The health characteristics of U.S. adults have been well document and it clearly indicates that the status is poor. This research sought to identify the nutrition and health-related characteristics of employees at a particular mid-major university in the Midwest who participated in the Nutrition Assessment Lab between the academic years 2007-08 to 2015-16. This research also identified the demographic characteristics of participants and the factors associated with their participation. Furthermore, this research also evaluated employees' stage of change toward certain nutrition and health habits while gathering an understanding of what services employees were interested in utilizing.

This research aimed to identify the demographics, health conditions, and nutrition status of employees who participated in the Nutrition Assessment Lab. Based on the Nutrition

Assessment Lab Questionnaire (NAL-Q), the majority of participants were white females and over half were either professionals or professors. According to the recorded anthropometric measures, over half of participants were overweight or obese. Of the biochemical measures, the mean LDL cholesterol and mean total cholesterol/HDL ratio were above recommended levels. Nearly 70% of participants had LDL cholesterol above the optimal range and nearly 30% had triglycerides above optimal. Nearly 20% had elevated blood glucose. For clinical measures, over half of participants had elevated systolic blood pressure and over one-quarter had elevated diastolic blood pressure. Significant differences between males and females were noted for LDL-cholesterol, HDL-cholesterol, and systolic blood. These results indicate that, based on these select criteria, the participants did not have optimal health.

The percentage of NAL participants who had high total cholesterol, LDL cholesterol, triglycerides, and low HDL cholesterol was higher than comparable results of all U.S. adults; in contrast, the prevalence of impaired fasting glucose and diabetes among NAL participants was lower than the national average.

When asked why participants came to the NAL, the majority of respondents indicated, “to lose weight” and “improve overall diet.” This is not surprising when considering the current rate of overweight and obesity among NAL participants. Over half of the participants were interested in receiving menu-planning advice and nearly half were interested in learning more about healthy eating.

When evaluating the health habits and conditions of NAL participants, two-thirds of participants take part in physical activity at least three days per week. Regarding alcohol intake, the majority of participants consumed alcohol “rarely” or “never.” Only slightly more than 1%

currently uses tobacco. The most prevalent self-reported health conditions on the NAL-Q were high cholesterol and high blood pressure.

When evaluating the nutrition habits of NAL participants, a large majority are not consuming the recommended intake of fruits and vegetables, dairy, or whole grains. A large percentage is consuming fruits and vegetables less than five times per day. Nearly two-thirds of participants are consuming whole grain products only once or twice a day. This indicates a need for nutrition education and behavioral change strategies in this population.

Many of the participants who came to the NAL were in the action stage and were thinking about or were already practicing some positive lifestyle actions related to selected nutrition and health habits. Of note, about one-third of participants “feel ready to start” losing weight.

### **Limitations of the Study:**

As the researcher examines the results of the study, several limitations must be considered:

- The study was conducted at one Midwestern university and may not adequately portray the characteristics, interests, and nutrition habits and conditions of all university employees.
- The nutrition and health habits results are self-reported.
- Although the completion of the NAL-Q is a part of the standard protocol in the NAL, not all participants completed the survey.
- The services of the NAL-Q are voluntary and not all participants had all of the measurements (body composition, blood pressure, bone density, etc.) taken.

- A CardioChek was previously used to measure lipid panel and then replaced with a Cholestech around January 2011.
- In some instances, not all of the lab values, such as HDL and LDL, were recorded due to the limitations of the Cholestech equipment (i.e., if the value was out of range, the instrument did not provide the value)..
- Missing values for the biometric screening results were left missing (i.e., were not imputed), resulting in unequal responses for most categories.
- In a few case, the technical assumption requiring a minimum of five subjects per cell for Chi Square analyses was violated is due to the low number of male participants.

### **Recommendations for Further Research**

Based on the results of the present study, additional research on the characteristics of NAL participants is warranted. The following suggestions are made both for future research and to improve the services provided by thte Nutrition Assessment Laboratory:

- The survey should be given to all participants who engage with the NAL.
- The NAL-Q should be given to participants each new academic year and/or after they have participated in NAL programs for six months as a means to collect follow-up data.
- The Stages of Change questions should be included on all follow-up surveys.
- The NAL-Q anthropometric measurements should include waist circumference, as it is a criteria for metabolic syndrome criteria.
- Lower participation by service and shift workers may related to having a less flexible schedule. Worksite wellness programs, including the one in the present



study, should evaluate effective strategies to engage with service employees and night shift workers. This may include making the programs more accessible by offering them different locations and times. Furthermore, programs should evaluate the wellness needs and goals of employees in these positions, as they may be different from other positions.

- A question should be added to the NAL-Q that asks participants to identify their personal goal(s). This information will help the graduate assistant in the NAL to address the clients' goals. In addition, it can guide the NAL in offering relevant services and programs that align with the goals of the clientele.
- Regular follow-up with clients will be important for the longevity of the NAL and the personal success of the clients. A protocol for follow-up, including when and how, should be established for the Graduate Assistants managing the NAL.

## **Summary**

In summary, although all faculty and staff are encouraged to use the services of the Nutrition Assessment Laboratory, the nutrition and health characteristics of participants who sought services at the Nutrition Assessment Lab were suboptimal, with many having health risks and suboptimal dietary habits. The most prevalent conditions of NAL participants were high cholesterol and high blood pressure. Overall, participants were most interested in improving cholesterol, losing weight, and menu planning. Those who engaged in the NAL were most often in the preparation or action stage of change for various health habits. The results indicate that the NAL participants at this Midwest University were seeking information and were ready for behavior change. Continued services through the NAL will be beneficial to their personal health

and wellness. It is important for wellness programs to understand the characteristics and interests of participants as it may enhance the effectiveness and evaluation of current services. Further research is needed to evaluate if the results and findings in this study are consistent with other university wellness programs and if the current nutrition services are effective interventions for behavior change and improved health outcomes.

## REFERENCES

- Abargouei, A. S., Janghorbani, M., Salehi-Marzijarani, M., & Esmailzadeh, A. (2012). Effect of dairy consumption on weight and body composition in adults: A systematic review and meta-analysis of randomized controlled clinical trials. *Int J Obes*, 36(12), 1485-1493. doi:10.1038/ijo.2011.269
- Adams, P., Kirzinger, W., & Martinez, M. (2013). *Summary health statistics for the U.S. population: National Health Interview Survey, 2012*. Retrieved from [http://www.cdc.gov/nchs/data/series/sr\\_10/sr10\\_259.pdf](http://www.cdc.gov/nchs/data/series/sr_10/sr10_259.pdf)
- Aguilar, M., Bhuket, T., Torres, S., Liu, B., & Wong, R. J. (2015). Prevalence of the metabolic syndrome in the United States, 2003-2012. *JAMA*, 313(19), 1973-1974. doi:10.1001/jama.2015.4260
- Alberti, K. G. M. M., Zimmet, P., & Shaw, J. (2006). Metabolic syndrome—a new world-wide definition. A consensus statement from the International Diabetes Federation. *Diabetic Medicine*, 23(5), 469-480. doi:10.1111/j.1464-5491.2006.01858.x
- Albertson, A. M., Reicks, M., Joshi, N., & Gugger, C. K. (2016). Whole grain consumption trends and associations with body weight measures in the United States: Results from the cross sectional National Health and Nutrition Examination Survey 2001–2012. *Nutrition Journal*, 15(8). doi:10.1186/s12937-016-0126-4
- Aldana, S. G., Merrill, R. M., Price, K., Hardy, A., & Hager, R. (2005). Financial impact of a comprehensive multisite workplace health promotion program. *Preventive Medicine*, 40(2), 131-137. Retrieved from <http://dx.doi.org/10.1016/j.ypmed.2004.05.008>
- Alere. (n.d.). Alere Cholestech LDX System. Retrieved from <http://www.alere.com/en/home/product-details/cholesteck-ldx-system.html?c=US>
- American Diabetes Association. (2009). Diagnosis and classification of diabetes mellitus. *Diabetes Care*, 33(Supplement 1), S62-S69. Retrieved from [http://care.diabetesjournals.org/content/33/Supplement\\_1/S62.abstract](http://care.diabetesjournals.org/content/33/Supplement_1/S62.abstract)
- American Heart Association. (2008). Policy position statement on effective worksite wellness programs. Retrieved from [https://www.heart.org/idc/groups/heart-public/@wcm/@hcm/documents/downloadable/ucm\\_308067.pdf](https://www.heart.org/idc/groups/heart-public/@wcm/@hcm/documents/downloadable/ucm_308067.pdf)

- Anderko, L., Roffenbender, J., Goetzel, R., Millard, F., Wildenhaus, K., DeSantis, C., & Novelli, W. (2012). Promoting prevention through the Affordable Care Act: Workplace wellness. *Preventing Chronic Disease*, 9. doi:<http://dx.doi.org/10.5888/pcd9.120092>
- Anderson, L. M., Quinn, T. A., Glanz, K., Ramirez, G., Kahwati, L. C., Johnson, D. B., . . . Katz, D. L. (2009). The effectiveness of worksite nutrition and physical activity interventions for controlling employee overweight and obesity: A systematic review. *Am J Prev Med*, 37(4), 340-357. doi:10.1016/j.amepre.2009.07.003
- Anthem., & Stevens, K. (2016). *BSU Chronic Employees [Data set]*. Retrieved from: email communication January 2017
- Assistant Secretary for Public Affairs. (2015). Key Features of the Affordable Care Act Retrieved from <http://www.hhs.gov/healthcare/facts-and-features/key-features-of-aca-by-year/index.html>
- Ausburn, T. F., LaCoursiere, S., Crouter, S. E., & McKay, T. (2014). Review of worksite weight management programs. *Workplace Health & Safety*, 62(3), 122-126. doi:<http://dx.doi.org/10.3928/21650799-20140219-06>
- Baicker, K., Cutler, D., & Song, Z. (2010). Workplace wellness programs can generate savings. *Health Affairs*, 29(2), 304-311. doi:10.1377/hlthaff.2009.0626
- Bailey, R. L., Gahche, J. J., Miller, P. E., Thomas, P. R., & Dwyer, J. T. (2013). Why U.S. adults use dietary supplements. *JAMA Internal Medicine*, 173(5), 355-361. doi:10.1001/jamainternmed.2013.2299
- Benjamin, E. J., Blaha, M. J., Chiuve, S. E., Cushman, M., Das, S. R., Deo, R., . . . Muntner, P. (2017). Heart disease and stroke statistics—2017 update: A report from the American Heart Association. *Circulation*, 135(6), e1-e458. Retrieved from <http://circ.ahajournals.org/content/early/2017/01/25/CIR.0000000000000485.abstract>
- Bish, C. L., Blanck, H. M., Serdula, M. K., Marcus, M., Kohl, H. W., & Khan, L. K. (2005). Diet and physical activity behaviors among Americans trying to lose weight: 2000 Behavioral Risk Factor Surveillance System. *Obesity Research*, 13(3), 596-607. doi:10.1038/oby.2005.64
- Blumenthal, D., Abrams, M., & Nuzum, R. (2015). The Affordable Care Act at 5 years. *New England Journal of Medicine*, 372(25), 2451-2458. doi:10.1056/NEJMp1503614

- Bodenheimer, T., Chen, E., & Bennett, H. D. (2009). Confronting the growing burden of chronic disease: Can the U.S. health care workforce do the job? *Health Affairs*, 28(1), 64-74. doi:10.1377/hlthaff.28.1.64
- Borah, B. J., Egginton, J. S., Shah, N. D., Wagie, A. E., Olsen, K. D., Yao, X., & Lopez-Jimenez, F. (2015). Association of worksite wellness center attendance with weight loss and health care cost savings: Mayo Clinic's experience. *Journal of Occupational and Environmental Medicine*, 57(3), 229-234. doi:10.1097/JOM.0000000000000392
- Bowman, S., Clemens, J., Friday, J., Thoerig, R., & Moshfegh, A. (2014). Food patterns equivalents intakes from food: Mean amounts consumed per individual, What We Eat in America, NHANES 2011-2012; Tables 1-4. *Worldwide Web Site: Food Surveys Research Group*. Retrieved from [www.ars.usda.gov/Services/docs.htm?docid=23871](http://www.ars.usda.gov/Services/docs.htm?docid=23871)
- Bruening, M., Udarbe, A. Z., Yakes Jimenez, E., Stell Crowley, P., Fredericks, D. C., & Edwards Hall, L. A. (2015). Academy of Nutrition and Dietetics: Standards of practice and standards of professional performance for Registered Dietitian Nutritionists (competent, proficient, and expert) in public health and community nutrition. *Journal of the Academy of Nutrition and Dietetics*, 115(10), 1699-1709.e1639. doi:10.1016/j.jand.2015.06.374
- Bullard, K. M., Saydah, S. H., Imperatore, G., Cowie, C. C., Gregg, E. W., Geiss, L. S., . . . Caspersen, C. J. (2013). Secular changes in U.S. prediabetes prevalence defined by hemoglobin A1c and fasting plasma glucose. *Diabetes Care*, 36(8), 2286-2293. doi:10.2337/dc12-2563
- Burton, W. N., Chen, C.-Y., Conti, D. J., Schultz, A. B., Pransky, G., & Edington, D. W. (2005). The association of health risks with on-the-job productivity *Journal of Occupational and Environmental Medicine*, 47(8), 769-777. doi:10.1097/01.jom.0000169088.03301.e4
- Burwell, S. M., Frieden, T. R., & Rothwell, C. J. (2016). Health, United States, 2015: With special features on racial and ethnic disparities. Retrieved from <https://www.cdc.gov/nchs/data/hus/hus15.pdf>
- Butler, C. E., Clark, B. R., Burlis, T. L., Castillo, J. C., & Racette, S. B. (2015). Physical activity for campus employees: A university worksite wellness program. *Journal of physical activity & health*, 12(4), 470-476. doi:10.1123/jpah.2013-0185
- Byers, T., Mullis, R., Anderson, J., Dusenbury, L., Gorsky, R., Kimber, C., . . . Perry, G. (1995). The costs and effects of a nutritional education program following work-site cholesterol screening. *American Journal of Public Health*, 85(5), 650-655. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1615435/>

- Campos, S., Doxey, J., & Hammond, D. (2011). Nutrition labels on pre-packaged foods: A systematic review. *Public Health Nutrition*, 14(8), 1496-1506.  
doi:<http://dx.doi.org/10.1017/S1368980010003290>
- Cancelliere, C., Cassidy, J., Ammendolia, C., & Côté, P. (2011). Are workplace health promotion programs effective at improving presenteeism in workers? A systematic review and best evidence synthesis of the literature. *BMC Public Health*, 11(1), 1-11.  
doi:10.1186/1471-2458-11-395
- Carey, M., Markham, C., Gaffney, P., Boran, C., & Maher, V. (2006). Validation of a point of care lipid analyser using a hospital based reference laboratory. *Ir J Med Sci*, 175(4), 30-35.
- Carroll, M. D., Frayar, C. D., & Kit, B. K. (2015). Total and high-density lipoprotein cholesterol in adults: United States, 2011-2014 *NCHS Data Brief*, no 226. Hyattsville, MD.
- Carroll, M. D., Kit, B. K., & Lacher, D. A. (2015). *Trends in elevated triglyceride in adults: United States, 2001-2012*. Retrieved from Hyattsville, MD:  
<https://www.cdc.gov/nchs/products/databriefs/db198.htm>
- CDC. (2011). *Vital signs: Prevalence, treatment, and control of high levels of low-density lipoprotein cholesterol - United States, 1999--2002 and 2005--2008*. Retrieved from [http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6004a5.htm?s\\_cid=mm6004a5\\_w](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6004a5.htm?s_cid=mm6004a5_w)
- CDC. (2014a). Potentially preventable deaths from the five leading causes of death - United States, 2008-2010. *Morbidity and Mortality Weekly Report*, 63(17), 369-374. Retrieved from <http://www.cdc.gov/mmWR/preview/mmwrhtml/mm6317a1.htm>
- CDC. (2014b). *Summary Health Statistics: National Health Interview Survey, 2014*. Retrieved from [https://ftp.cdc.gov/pub/Health\\_Statistics/NCHS/NHIS/SHS/2014\\_SHS\\_Table\\_A-18.pdf](https://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2014_SHS_Table_A-18.pdf)
- CDC. (2015). BRFSS Prevalence & Trends Data (online) Retrieved from <https://www.cdc.gov/brfss/brfssprevalence/>.
- CDC. (2016). Healthy People 2020 Objectives for the Nation. Retrieved from <https://www.healthypeople.gov/2020/About-Healthy-People>

- CDC/NCHS. (2015). *National Health Interview Survey, 2014*. Retrieved from [http://www.cdc.gov/nchs/data/nhis/earlyrelease/earlyrelease201506\\_07.pdf](http://www.cdc.gov/nchs/data/nhis/earlyrelease/earlyrelease201506_07.pdf)
- Centers for Disease Control and Prevention. (2012). Defining Adult Overweight and Obesity. Retrieved from <http://www.cdc.gov/obesity/adult/defining.html>
- Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention, & Health Promotion Division of Population Health. (2015). BRFSS Prevalence & Trends Data Retrieved from <https://www.cdc.gov/brfss/brfssprevalence/>.
- Centers for Medicaid & Medicare Services. National health expenditures projections 2012-2022. Retrieved from <https://www.cms.gov/research-statistics-data-and-systems/statistics-trends-and-reports/nationalhealthexpenddata/downloads/proj2012.pdf>
- Cholestech Corporation. Cholestech LDX System User Manual. Hayward, CA.
- Commission on Dietetic Registration. (2016). Registration eligibility general information. Retrieved from <https://www.cdrnet.org/certifications/registration-eligibility-general-information-rde>
- Cowdery, J. E., Suggs, L. S., & Parker, S. (2007). Application of a Web-based tailored health risk assessment in a work-site population. *Health Promot Pract*, 8(1), 88-95. doi:10.1177/1524839905278892
- Dale, R. A., Jensen, L. H., & Krantz, M. J. (2008). Comparison of two point-of-care lipid analyzers for use in global cardiovascular risk assessments. *Ann Pharmacother*, 42(5), 633-639. doi:10.1345/aph.1K688
- Davis, C. E., Williams, D. H., Oganov, R. G., Tao, S. C., Rywik, S. L., Stein, Y., & Little, J. A. (1996). Sex differences in high density lipoprotein cholesterol in six countries. *American Journal of Epidemiology*, 143(11), 1100-1106.
- Dugan, A. (2014). Americans still avoid fat more than carbs. *Well-being*. Retrieved from gallup.com website: <http://www.gallup.com/poll/174176/americans-avoid-fat-carbs.aspx>
- Evan, S., & Eibner, C. (September 2016). Donal Trump's health care reform proposals: Anticipated effects on insurance coverage, out-of-pocket costs, and the federal deficit. *The Commonwealth Fund*. Retrieved from

<http://www.commonwealthfund.org/publications/issue-briefs/2016/sep/trump-presidential-health-care-proposal>

Fox, J. B., & Shaw, F. E. (2015). Clinical preventive services coverage and the Affordable Care Act. *American Journal of Public Health*, 105(1), E7-E10. Retrieved from <https://search.proquest.com/docview/1644457276?accountid=8483>

Frayar, C. D., Carroll, M. D., & Ogden, C. L. (2016). *Prevalance of overweight, obesity, and extreme obesity among adults aged 20 and over: United States, 1960-1962 through 2013-2014*. Retrieved from [http://www.cdc.gov/nchs/data/hestat/obesity\\_adult\\_13\\_14/obesity\\_adult\\_13\\_14.pdf](http://www.cdc.gov/nchs/data/hestat/obesity_adult_13_14/obesity_adult_13_14.pdf)

Freid, V., Bernstein, A., & Bush, M. (2012). Multiple chronic conditions among adults aged 45 and over: Trends over the past 10 years. NCHS data brief, no. 100 (Vol. 100). Hyattsville, MD: National Center for Health Statistics.

Fronstin, P., Employee Benefit Research Institute, & Roebuck, M. C. (2015). Financial incentives, workplace wellness program participation, and utilization of health care services and spending. *EBRI Issue Brief*(No. 417), 4-20. Retrieved from [https://www.ebri.org/pdf/briefspdf/EBRI\\_IB\\_417.Aug15.Wellness.pdf](https://www.ebri.org/pdf/briefspdf/EBRI_IB_417.Aug15.Wellness.pdf)

Fryar, C., Gu, Q., Ogden, C., & Flegal, K. (2016). Anthropometric reference data for children and adults: United States. National Center for Health Statistics. *Vital health statistics*, 3(39), 8-16. Retrieved from <https://stacks.cdc.gov/view/cdc/40572>

Geaney, F., Kelly, C., Di Marrazzo, J. S., Harrington, J. M., Fitzgerald, A. P., Greiner, B. A., & Perry, I. J. (2016). The effect of complex workplace dietary interventions on employees' dietary intakes, nutrition knowledge and health status: A cluster controlled trial. *Preventive Medicine*, 89, 76-83. doi:10.1016/j.ypmed.2016.05.005

Gibbons, R. J., Jones, D. W., Gardner, T. J., Goldstein, L. B., Moller, J. H., & Yancy, C. W. (2008). The American Heart Association's 2008 statement of principles for healthcare reform. *Circulation*, 118(21), 2209-2218. doi:10.1161/circulationaha.108.191092

Glanz, K., Patterson, R. E., Kristal, A. R., Feng, Z., Linnan, L., Heimendinger, J., & Hebert, J. R. (1998). Impact of work site health promotion on stages of dietary change: The Working Well Trial. *Health Education & Behavior*, 25(4), 448-463.

Guenther, P. M., Bowman, S. A., & Goldman, J. D. (2010). *Alcoholic beverage consumption by adults 21 years and over in the United States: Results from the National Health and*



- Nutrition Examination Survey, 2003-2006: Technical report.* Retrieved from Baltsville, Maryland: <http://www.cnpp.usda.gov/DGAs2010-Meeting5.htm>.
- Hedden, S. L., Kennet, J., Lipari, R., Medley, G., & Tice, P. (2015). Behavioral health trends in the United States: Results from the 2014 national survey on drug use and health. Retrieved from <https://www.samhsa.gov/data/sites/default/files/NSDUH-FRR1-2014/NSDUH-FRR1-2014.pdf>
- International Society for Clinical Densitometry. (2015). 2015 ISCD Official Positions - Adult Retrieved from <http://www.iscd.org/official-positions/2015-iscd-official-positions-adult/>
- Jensen, J. D. (2011). Can worksite nutritional interventions improve productivity and firm profitability? A literature review. *Perspectives in Public Health*, 131(4), 184-192. doi:10.1177/1757913911408263
- Jylhä, M. (2009). What is self-rated health and why does it predict mortality? Towards a unified conceptual model. *Social Science & Medicine*, 69(3), 307-316. doi:<http://dx.doi.org/10.1016/j.socscimed.2009.05.013>
- Kelly, T. L., Wilson, K. E., & Heymsfield, S. B. (2009). Dual Energy X-Ray Absorptiometry body composition reference values from NHANES. *PLOS ONE*, 4(9), e7038. doi:10.1371/journal.pone.0007038
- Li, C., Ford, E. S., Zhao, G., Balluz, L. S., & Giles, W. H. (2009). Estimates of body composition with dual-energy X-ray absorptiometry in adults. *Am J Clin Nutr*, 90(6), 1457-1465. doi:10.3945/ajcn.2009.28141
- Lloyd-Jones, D. M., Hong, Y., Labarthe, D., Mozaffarian, D., Appel, L. J., Van Horn, L., . . . Rosamond, W. D. (2010). Defining and setting national goals for cardiovascular health promotion and disease reduction. *Circulation*, 121(4), 586-613. doi:<http://dx.doi.org/10.1161/CIRCULATIONAHA.109.192703>
- Looker, A. C., Borrud, L. G., Dawson-Hughes, B., Shepherd, J. A., & Wright, N. C. (2012). Osteoporosis or low bone mass at the femur neck or lumbar spine in older adults: United States, 2005-2008. *NCHS Data Brief*(93).
- Lucas, J., & Benson, V. (2015). *Tables of summary health statistics for the U.S. population: 2015 National Health Interview Survey*. Retrieved from <http://www.cdc.gov/nchs/nhis/SHS/tables.htm>.

- Masters, R. K., Reither, E. N., Powers, D. A., Yang, Y. C., Burger, A., & Link, B. G. (2013). The impact of obesity on US mortality levels: The importance of age and cohort factors in population estimates. *American Journal of Public Health, 103*(10), 1895-1901. doi:10.2105/AJPH.2013.301379
- Mattke, S., Schnyer, C., & Van Busum, K. R. (2012). *A review of the U.S. workplace wellness market*. Retrieved from <http://www.dol.gov/ebsa/pdf/workplacewellnessmarketreview2012.pdf>
- McCarthy, J. (2015). Fewer Americans say they want to lose weight. November 27, 2015. Retrieved from <http://www.gallup.com/poll/186920/fewer-americans-say-lose-weight.aspx>
- Menke, A., Casagrande, S., Geiss, L., & Cowie, C. C. (2015). Prevalence of and trends in diabetes among adults in the United States, 1988-2012. *JAMA, 314*(10), 1021-1029. doi:10.1001/jama.2015.10029
- Merrill, R. M., & Sloan, A. (2014). Effectiveness of a health promotion program among employees in a western United States school district. *Journal of Occupational and Environmental Medicine, 56*(6), 639-644. doi:10.1097/JOM.0000000000000153
- Michaels, C. N., & Greene, A. M. (2013). Worksite wellness: Increasing adoption of workplace health promotion programs. *Health promotion practice, 14*(4), 473-479. doi:10.1177/1524839913480800
- Milani, R. V., & Lavie, C. J. (2009). Impact of worksite wellness intervention on cardiac risk factors and one-year health care costs. *The American Journal of Cardiology, 104*, 1389-1392. doi:10.1016/j.amjcard.2009.07.007
- Millen, B., Lichtenstein, A., Abrams, S., Adams-Campbell, L., Anderson, C., Brenna, J., . . . Story, M. (2015). *Scientific Report of the 2015 Dietary Guidelines Advisory Committee*. Retrieved from <https://health.gov/dietaryguidelines/2015-scientific-report/06-chapter-1/>
- Molaison, E. F. (2002). Stages of change in clinical nutrition practice. *Nutr Clin Care, 5*(5), 251-257.
- Moore, L. V., & Thompson, F. E. (2015). Adults meeting fruit and vegetable intake recommendations - United States, 2013. *Morbidity and Mortality Weekly Report 2015, 64*(26), 709-713. Retrieved from <https://www.cdc.gov/Mmwr/pdf/wk/mm6426.pdf>

- Moriarty, J. P., Branda, M. E., Olsen, K. D., Shah, M. D., Borah, B. J., Wagie, A. E., . . . Naessens, J. M. (2012). The effects of incremental costs of smoking and obesity on health care costs among adults. *Journal of Occupational and Environmental Medicine*, 54(3), 286-291. doi:10.1097/JOM.Ob013e318246ff4
- Mozaffarian, D., Benjamin, E. J., Go, A. S., Arnett, D. K., Blaha, M. J., Cushman, M., . . . Turner, M. B. (2014). Heart disease and stroke statistics—2015 Update. *Circulation*. doi: <http://dx.doi.org/10.1161/CIR.0000000000000152>
- Mozaffarian, D., & Ludwig, D. S. (2015). The 2015 US Dietary Guidelines: Lifting the ban on total dietary fat. *JAMA*, 313(24), 2421-2422. doi:10.1001/jama.2015.5941
- National Cancer Institute. (2015). *Usual Dietary Intakes: Food Intakes U.S. Population, 2007-10*. Retrieved from <http://epi.grants.cancer.gov/diet/usualintakes/pop/2007-10/>
- National Center for Health Statistics. (2015). Summary Health Statistics: National Health Interview Survey, 2015. Retrieved from [https://ftp.cdc.gov/pub/Health\\_Statistics/NCHS/NHIS/SHS/2015\\_SHS\\_Table\\_A-12.pdf](https://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2015_SHS_Table_A-12.pdf)
- National Center for Health Statistics. (2016). *Healthy People 2020 midcourse review*. Retrieved from Hyattsville, MD: [https://www.cdc.gov/nchs/healthy\\_people/hp2020/hp2020\\_midcourse\\_review.htm](https://www.cdc.gov/nchs/healthy_people/hp2020/hp2020_midcourse_review.htm)
- National Institute of Health. (2001). ATP III At-A-Glance: Quick Desk Reference. Retrieved from <http://www.nhlbi.nih.gov/health-pro/guidelines/current/cholesterol-guidelines/quick-desk-reference-html>
- National Osteoporosis Foundation. (2016). Bone Density Exam/Testing. Retrieved from <https://www.nof.org/patients/diagnosis-information/bone-density-examtesting/>
- NIH Osteoporosis and Related Bone Diseases. (2015). Bone mass measurements: What the numbers mean. Retrieved from [http://www.niams.nih.gov/health\\_info/bone/bone\\_health/bone\\_mass\\_measure.asp](http://www.niams.nih.gov/health_info/bone/bone_health/bone_mass_measure.asp)
- Nwankwo, T., Yoon, S. S., Burt, V., & Gu, Q. (2013). Hypertension among adults in the United States: National Health and Nutrition Examination Survey, 2011-2012. *NCHS Data Brief*(133), 1-8.

- Ogden, C. L., Carroll, M. D., Fryar, C. D., & Flegal, K. M. (2015). Prevalence of obesity among adults and youth: United States, 2011-2014. *NCHS Data Brief*(219), 1-7. Retrieved from <http://www.cdc.gov/nchs/products/databriefs/db219.htm>
- Omron. (2003). Frequently Asked Questions. Retrieved from <http://www.omron-healthcare.com/en/products/bloodpressuremonitoring#>
- Plüddemann, A., Thompson, M., Price, C. P., Wolstenholme, J., & Heneghan, C. (2012). Point-of-care testing for the analysis of lipid panels: primary care diagnostic technology update. *The British Journal of General Practice*, 62(596), e224-e226. doi:10.3399/bjgp12X630241
- Prochaska, J. O., Butterworth, S., Redding, C. A., Burden, V., Perrin, N., Leo, M., . . . Prochaska, J. M. (2008). Initial efficacy of MI, TTM tailoring and HRI's with multiple behaviors for employee health promotion. *Prev Med*, 46(3), 226-231. doi:10.1016/j.ypmed.2007.11.007
- Prochaska, J. O., DiClemente, C. C., & Norcross, J. C. (1992). In search of how people change. Applications to addictive behaviors. *Am Psychol*, 47(9), 1102-1114.
- Prochaska, J. O., Redding, C. A., & Evers, K. (2002). The Transtheoretical Model and Stages of Change. In K. Glanz, B.K. Rimer & F.M. Lewis (Eds.), *Health Behavior and Health Education: Theory, Research, and Practice* (3rd ed.). San Francisco, CA: Jossey-Bass, Inc
- Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion*, 12(1), 38-48.
- Prospective Studies Collaboration. (2009). Body-mass index and cause-specific mortality in 900 000 adults: Collaborative analyses of 57 prospective studies. *The Lancet*, 373(9669), 1083-1096. doi:[http://dx.doi.org/10.1016/S0140-6736\(09\)60318-4](http://dx.doi.org/10.1016/S0140-6736(09)60318-4)
- Rehm, C. D., Penalvo, J. L., Afshin, A., & Mozaffarian, D. (2016). Dietary intake among US adults, 1999-2012. *JAMA*, 315(23), 2542-2553. doi:10.1001/jama.2016.7491
- Rigsby, A., Gropper, D. M., & Gropper, S. S. (2009). Success of women in a worksite weight loss program: Does being part of a group help? *Eating Behaviors*, 10(2), 128-130. doi:<http://dx.doi.org/10.1016/j.eatbeh.2009.01.002>

- Robroek, S. J., van Lenthe, F. J., van Empelen, P., & Burdorf, A. (2009). Determinants of participation in worksite health promotion programmes: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, 6(1), 26. doi:10.1186/1479-5868-6-26
- Rongen, A., Robroek, S. J. W., Lenthe, F. J. v., & Burdorf, A. (2013). Workplace health promotion a meta-analysis of effectiveness. *American Journal of Preventative Medicine*, 44(4), 406-415. Retrieved from <http://dx.doi.org/10.1016/j.amepre.2012.12.007>
- Rosamond, W., Flegal, K., Furie, K., Go, A., Greenlund, K., Haase, N., . . . Hong, Y. (2008). Heart Disease and Stroke Statistics—2008 Update: A Report From the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation*, 117(4), e25-e146. doi:10.1161/circulationaha.107.187998
- Rosinger, A., Carroll, M. D., Lacher, D., & Ogden, C. L. (2016). Trends in total cholesterol, triglycerides, and low-density lipoprotein in US adults, 1999-2014. *JAMA Cardiology*, E1. doi:10.1001/jamacardio.2016.4396
- Schoeborn, C. A., Adams, P. F., & Peregoy, J. A. (2013). Health behaviors of adults: United States, 2008-2010. *Vital and health statistics 10*(257). Retrieved from [https://www.cdc.gov/nchs/data/series/sr\\_10/sr10\\_257.pdf](https://www.cdc.gov/nchs/data/series/sr_10/sr10_257.pdf)
- Seca. (n.d. ). Seca 225. Hamburg, Germany.
- Shaw, F., Asomugha, C., Conway, P., & Sein, A. (2014). The Patient Protection and Affordable Care Act: Opportunities for prevention and public health. *Lancet*, 384, 75-82
- Sluijs, I., Forouhi, N. G., Beulens, J. W., van der Schouw, Y. T., Agnoli, C., Arriola, L., . . . Wareham, N. J. (2012). The amount and type of dairy product intake and incident type 2 diabetes: Results from the EPIC-InterAct Study. *Am J Clin Nutr*, 96(2), 382-390. doi:10.3945/ajcn.111.021907
- Sommers, B. D., Gunja, M. Z., Finegold, K., & Musco, T. (2015). Changes in self-reported insurance coverage, access to care, and health under the Affordable Care Act. *JAMA*, 314(4), 366-374. doi:10.1001/jama.2015.8421

- Song, X., Quek, R. G. W., Gandra, S. R., Cappell, K. A., Fowler, R., & Cong, Z. (2015). Productivity loss and indirect costs associated with cardiovascular events and related clinical procedures *BMC Health Services Research*, 15(10), 245. doi:10.1186/s12913-015-0925-x
- Spencer, L., Wharton, C., Moyle, S., & Adams, T. (2007). The transtheoretical model as applied to dietary behaviour and outcomes. *Nutr Res Rev*, 20(1), 46-73. doi:10.1017/s0954422407747881
- Tanita Corporation. Body Composition Analyzer BC-418 Instruction Manual (pp. 23). Arlington Heights, Illinois: Tanitia Corporation of America, Inc
- Tanita Corporation. Tanita Body Composition Analyzer Technical Notes (Vol. Arlington Heights, IL): Tanita Corporation of American.
- Todd, J. E. (2014). Changes in eating patterns and diet quality among working-age adults, 2005-2010: U.S. Department of Agriculture, Economic Research Service
- Trust for America's Health and Robert Wood Johnson Foundation. (2016). *The State of Obesity 2016*. Retrieved from Washington, D.C.: <http://www.stateofobesity.org/files/stateofobesity2016.pdf>
- Tucker, J. M., Welk, G. J., & Beyler, N. K. (2011). Physical activity in U.S.: Adults compliance with the Physical Activity Guidelines for Americans. *Am J Prev Med*, 40(4), 454-461. doi:10.1016/j.amepre.2010.12.016
- Tuma, P. A. (2012). An overview of the intentions of health care reform. *J Acad Nutr Diet*, 112(3), S56-63. doi:10.1016/j.jand.2011.12.012
- Turner, S. L., Thomas, A. M., Wagner, P. J., & Moseley, G. C. (2008). A collaborative approach to wellness: Diet, exercise, and education to impact behavior change. *Journal of the American Academy of Nurse Practitioners*, 20(6), 339-344. doi:10.1111/j.1745-7599.2008.00325.x
- U.S. department of Agriculture, & Agriculture Research Service. (2014). *Food patterns equivalents intakes from food: Mean amounts consumed per individual, by gender and age, What We Eat in America, NHANES 2011-2012*. Retrieved from [www.ars.usda.gov/ba/bhnrc/fsrg](http://www.ars.usda.gov/ba/bhnrc/fsrg)

- U.S. Department of Health and Human Services. (2008). *2008 Physical activity guidelines for Americans*. Retrieved from Washington, D.C. : <https://health.gov/paguidelines/guidelines/>
- U.S. Department of Health and Human Services. (2016, September 5, 2016). Healthy People 2020. Retrieved from <https://www.healthypeople.gov/2020/About-Healthy-People>
- U.S. Department of Health and Human Services and U.S. Department of Agriculture. (December 2015). *2015-2020 Dietary Guidelines for Americans*. Washington, D.C. Retrieved from <http://health.gov/dietaryguidelines/2015/guidelines/>
- U.S. Dept. of HHS. (2010). *Educational and Community-Based Programs*. Retrieved from <https://www.healthypeople.gov/2020/topics-objectives/topic/educational-and-community-based-programs/objectives>
- van Dongen, J. M., Proper, K. I., van Wier, M. F., van der Beek, A. J., Bongers, P. M., van Mechelen, W., & van Tulder, M. W. (2012). A systematic review of the cost-effectiveness of worksite physical activity and/or nutrition programs. *Scand J Work Environ Health*, 38(5), 393-408. doi:10.5271/sjweh.3275
- Verweij, L. M., Coffeng, J., van Mechelen, W., & Proper, K. I. (2011). Meta-analyses of workplace physical activity and dietary behaviour interventions on weight outcomes. *Obesity Reviews*, 12(6), 406-429. doi:10.1111/j.1467-789X.2010.00765.x
- Ward, B. W., Clarke, T. C., Nugent, C. N., & Shiller, J. S. (2016). Early release of selected estimates based on data from the January -March 2015 National Health Interview Survey. National Center for Health Statistics. Retrieved from <http://www.cdc.gov/nchs/nhis.htm>.
- Ward, B. W., Schiller, J. S., & Goodman, R. A. (2014). Multiple chronic conditions among US adults: A 2012 update. *Preventing Chronic Disease*, 11, E62. doi:10.5888/pcd11.130389
- Working Well. (2011). Working Well Graduate Assistanship Resource Manual: Ball State University
- Xu, J., Murphy, S., Kochanek, K., & Bastian, B. (2016). *Deaths: Final Data for 2013*. Hyattsville, MD: National Center for Health Statistics.

APPENDIX A

INSTITUTIONAL REVIEW BOARD MATERIALS

CITI CERTIFICATE OF COMPLETION



## Appendix A – CITI Certificate of Completion

### COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM) COURSEWORK REQUIREMENTS REPORT\*

\* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Rebekah Vukovich (ID: 5267883)
- **Email:** mvukovich@bsu.edu
- **Institution Affiliation:** Ball State University (ID: 1568)
- **Institution Unit:** FCS
  
- **Curriculum Group:** Social & Behavioral Research - Basic/Refresher
- **Course Learner Group:** Same as Curriculum Group
- **Stage:** Stage 1 - Basic Course
- **Description:** Choose this group to satisfy CITI training requirements for Investigators and staff involved primarily in Social/Behavioral Research with human subjects.
  
- **Report ID:** 18227608
- **Completion Date:** 01/08/2016
- **Expiration Date:** 01/07/2019
- **Minimum Passing:** 80
- **Reported Score\*:** 100

| REQUIRED AND ELECTIVE MODULES ONLY  | DATE COMPLETED | SCORE      |
|---|----------------|------------|
| Belmont Report and CITI Course Introduction (ID: 1127)  | 12/30/15       | 3/3 (100%) |
| Students in Research (ID: 1321)   | 01/02/16       | 5/5 (100%) |
| History and Ethical Principles - SBE (ID: 490)  | 01/02/16       | 5/5 (100%) |
| Defining Research with Human Subjects - SBE (ID: 491)   | 01/02/16       | 5/5 (100%) |
| The Federal Regulations - SBE (ID: 502)   | 01/02/16       | 5/5 (100%) |
| Assessing Risk - SBE (ID: 503)  | 01/02/16       | 5/5 (100%) |
| Informed Consent - SBE (ID: 504)  | 01/02/16       | 5/5 (100%) |
| Privacy and Confidentiality - SBE (ID: 505)   | 01/02/16       | 5/5 (100%) |
| Research with Prisoners - SBE (ID: 506)   | 01/02/16       | 5/5 (100%) |
| Research with Children - SBE (ID: 507)  | 01/02/16       | 5/5 (100%) |
| Research in Public Elementary and Secondary Schools - SBE (ID: 508)                             | 01/02/16       | 5/5 (100%) |
| International Research - SBE (ID: 509)  | 01/02/16       | 5/5 (100%) |
| Internet-Based Research - SBE (ID: 510)   | 01/02/16       | 5/5 (100%) |
| Research and HIPAA Privacy Protections (ID: 14)   | 01/08/16       | 5/5 (100%) |
| Vulnerable Subjects - Research Involving Workers/Employees (ID: 483)                            | 01/08/16       | 4/4 (100%) |
| Conflicts of Interest in Research Involving Human Subjects (ID: 488)                            | 01/08/16       | 5/5 (100%) |
| Unanticipated Problems and Reporting Requirements in Social and Behavioral Research (ID: 14928) | 01/08/16       | 5/5 (100%) |
| Ball State University (ID: 13475)   | 01/08/16       | No Quiz    |

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

CITI Program  
Email: [citisupport@miami.edu](mailto:citisupport@miami.edu)  
Phone: 305-243-7970  
Web: <https://www.citiprogram.org>

APPENDIX B

SURVEY INSTRUMENTS

- B-1 Current Working Well Data Collection Form (August 2013-present)
- B-2 Original Working Well Data Collection Form (2008-August 2013)

| WORKSITE + WELLNESS   |              |              |
|---|--------------|--------------|
| <h2>Nutrition Assessment Laboratory</h2> <h3>Working Well Enrollment Form</h3>  |              |              |
| <p>The Ball State University Nutrition Assessment Laboratory conducts several forms of nutrition assessments, including anthropometric, clinical, dietary, and biochemical assessments. Most screenings are non-invasive, resulting in minimal risk to patients (e.g., fingerstick for biochemical analysis will require a skin puncture and removal of a small quantity of blood; as with any skin puncture, the risk to the patient may include minor bruising, bleeding, or infection at the puncture site). All universal precautions are practiced in the Nutrition Assessment Laboratory for the safety of patients and employees.</p>  |              |              |
| <p>The purpose of the Nutrition Assessment Laboratory is to help BSU faculty staff, and students take positive steps to improve their health, such as eating healthier, becoming more physically fit, and reducing any risk factors associated with chronic diseases such as diabetes, obesity, osteoporosis, and heart disease. To achieve this objective, information collected about you through your responses to surveys, questionnaires, and assessments will be maintained by the nutrition assessment lab.</p>  |              |              |
| <p>All information you provide will be kept confidential. Your information will help us plan future activities and will provide us with data to measure the impact of the lab as we try to help you identify and attain your health-related goals. The Nutrition Assessment Lab reserves the right to email you about upcoming events, appointment reminders, and health education messages to your preferred email address.</p>  |              |              |
| <p>Your participation in this lab is voluntary. It should NOT be used as a substitute for professional medical advice, diagnosis, or treatment. The Nutrition Assessment Lab will provide you with a copy of your results so that you may share them with your primary care physician. To ensure your privacy, the Nutrition Assessment Laboratory staff will not release your personal information directly to a third party.</p>  |              |              |
| <p>If you have any questions about your rights as a participant in this laboratory, please contact the Office of Research Integrity, BSU, Muncie, IN 47306, (765) 285-5070. Additional questions can be directed to Dr. Carol Friesen, Nutrition Assessment Lab Coordinator, at (765) 285-5925.</p>   |              |              |
| <p>.....</p>  |              |              |
| <p>I, _____, have reviewed the above information and I agree to participate in this Nutrition Assessment program. The objectives of the Nutrition Assessment Laboratory have been explained to me; any questions I had about the testing measurements used to evaluate my health have been answered to my satisfaction. I give my consent to participate and to share my results with the all Nutrition Assessment Laboratory staff. I understand my medical information may be used in a confidential manner to conduct assessments, conduct program evaluation, and conduct research activities. My name, however, will NEVER be used in any publication, document, or report without my prior written consent.</p> |              |              |
| Participant's Signature   | Today's Date | Phone Number |
| <p><input type="checkbox"/> If my results are OUT of acceptable range, I would like a follow-up call from the QuickClinic nurse practitioner.</p>   |              |              |

## ***Working Well* Nutrition Assessment Enrollment Form**

Name: \_\_\_\_\_ Birthdate: \_\_\_\_/\_\_\_\_/\_\_\_\_ Today's Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

Work Address: \_\_\_\_\_ Preferred Email Address: \_\_\_\_\_

Gender: ☐ Male ☐ Female

Race: ☐ White ☐ Black ☐ Asian ☐ Hispanic ☐ Other

### **About the Nutrition Assessment Laboratory...**

1. I came to the Nutrition Assessment Lab because I want to (check all that apply):

- |   |   |
|---|---|
| <input type="checkbox"/> Lose weight                      | <input type="checkbox"/> Help my blood pressure             |
| <input type="checkbox"/> Lower my cholesterol             | <input type="checkbox"/> Help my diabetes                   |
| <input type="checkbox"/> Help my back, legs, joints, etc. | <input type="checkbox"/> Help my heart condition            |
| <input type="checkbox"/> Have more energy                 | <input type="checkbox"/> Help prevent osteoporosis          |
| <input type="checkbox"/> Start a diet/exercise routine    | <input type="checkbox"/> Improve my overall diet            |
| <input type="checkbox"/> Learn more about diet/exercise   | <input type="checkbox"/> Identify health risks I might have |
| <input type="checkbox"/> Other: _____                     |   |

2. What programs would you like to Nutrition Lab to offer?

- |   |   |
|---|---|
| <input type="checkbox"/> Healthy Cooking Demonstrations | <input type="checkbox"/> Healthy Eating Discussions |
| <input type="checkbox"/> Supermarket Tours              | <input type="checkbox"/> Weight Loss Competitions   |
| <input type="checkbox"/> Menu Planning Advice           | <input type="checkbox"/> Other: _____               |

### **About My Health Habits and Conditions...**

3. In a typical week, I take part in physical activity \_\_\_\_ days/week. (Examples: walking, gardening, dancing, jogging, bike riding, or anything that makes your heart beat faster).

- |  |                                   |
|--|-----------------------------------|
| <input type="checkbox"/> None (Skip to Question 5) | <input type="checkbox"/> 3-4 days |
| <input type="checkbox"/> 1-2 days                  | <input type="checkbox"/> 5-7 days |

4. On days when I take part in physical activity, I usually spend \_\_\_\_\_ minutes in this activity.

5. I typically consume alcoholic beverages.

- ☐ Never  
☐ Rarely (1 time per month or less)  
☐ Weekly  
☐ Daily

6. I smoke cigarettes, cigars, or chew smokeless tobacco.

- ☐ Never ☐ Used to; I quit ☐ Yes, \_\_\_\_\_ times/day

7. My health conditions are:

- |  |   |
|--|---|
| <input type="checkbox"/> Diabetes            | <input type="checkbox"/> Pre-diabetes                             |
| <input type="checkbox"/> High Blood Pressure | <input type="checkbox"/> Pre-hypertension                         |
| <input type="checkbox"/> High cholesterol    | <input type="checkbox"/> Osteopenia or Osteoporosis               |
| <input type="checkbox"/> High triglycerides  | <input type="checkbox"/> Eating disorder (anorexia/bulimia/other) |
| <input type="checkbox"/> Other: _____        |   |

8. In the past few months I have:

- ☐ Lost weight on purpose  
☐ Lost weight not on purpose  
☐ Stayed at my current weight  
☐ Gained weight

9. I think my overall health is:

- |                                    |                                    |
|------------------------------------|------------------------------------|
| <input type="checkbox"/> Very good | <input type="checkbox"/> Poor      |
| <input type="checkbox"/> Good      | <input type="checkbox"/> Very Poor |
| <input type="checkbox"/> Fair      |                                    |

### About My Nutrition Habits...

10. On a typical day, I usually eat or drink \_\_\_\_\_ servings of fruits and vegetables. *One serving is ½ cup cooked (about the size of a tennis ball), 1 cup raw, a medium fruit, ¾ cup of 100% juice, or 1 cup of salad greens.*
- ☐ None ☐ 2 per day ☐ 4 per day  
☐ 1 per day ☐ 3 per day ☐ 5 or more per day
11. On a typical day, I eat or drink dairy products (e.g., milk, cheese, and yogurt) \_\_\_\_\_ times per day.
- ☐ None (skip to #13) ☐ 2  
☐ 1 ☐ 3 or more
12. The type of dairy products (e.g., milk, cheese, yogurt) I buy most often contain
- ☐ Unsure ☐ 2% milk fat ☐ ½% milk fat  
☐ 4% milk fat ("whole" milk) ☐ 1% milk fat ☐ Nonfat or fat-free
13. I usually eat bread and cereal products \_\_\_\_\_. (Examples: bread, rice, noodles, bagels, crackers, muffins, rolls, tortilla, spaghetti, pasta or pita bread)
- ☐ None ☐ 5-6 times per day  
☐ 1-2 times per day ☐ 7-8 times per day  
☐ 3-4 times per day ☐ 9 or more times per day
14. I usually eat whole grain products \_\_\_\_\_. (Examples: brown rice, whole wheat bread, oatmeal, all bran cereal)
- ☐ Seldom/None ☐ 2 time per day ☐ 4 or more times per day  
☐ 1 time per day ☐ 3 times per day ☐ Unsure
15. I try to limit the amount of fat in my diet.
- ☐ Yes, all the time ☐ Sometimes ☐ No, not really
16. I use food labels to help me choose food items.
- ☐ Yes, all the time ☐ Sometimes ☐ No, not really
17. I take nutrient supplements.
- ☐ Yes, daily ☐ Sometimes ☐ No, not regularly

### Stage of Change

Read each statement on the left. Check the box that best describes how you feel TODAY:

| Statement of Readiness....   | I DON'T do<br>and I DON'T<br>think about it | I THINK<br>about it but<br>do NOT do | I feel<br>READY<br>to start | I do this<br>SOMETIMES   | I<br>USUALLY<br>do this  | I do this<br>ALL<br>the time |
|--|---|--------------------------------------|-----------------------------|--------------------------|--------------------------|------------------------------|
| I am able to improve the<br>types of healthy food I eat                | <input type="checkbox"/>                    | <input type="checkbox"/>             | <input type="checkbox"/>    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>     |
| I am able to lose weight   | <input type="checkbox"/>                    | <input type="checkbox"/>             | <input type="checkbox"/>    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>     |
| I eat 2-3 servings of<br>fruit every day                               | <input type="checkbox"/>                    | <input type="checkbox"/>             | <input type="checkbox"/>    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>     |
| I eat 2-3 servings of<br>vegetables every day                          | <input type="checkbox"/>                    | <input type="checkbox"/>             | <input type="checkbox"/>    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>     |
| I eat nonfat dairy<br>products every day                               | <input type="checkbox"/>                    | <input type="checkbox"/>             | <input type="checkbox"/>    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>     |
| I eat whole grain bread<br>and cereal products daily                   | <input type="checkbox"/>                    | <input type="checkbox"/>             | <input type="checkbox"/>    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>     |
| I get 30 minutes of some<br>type of aerobic activity<br>5 times a week | <input type="checkbox"/>                    | <input type="checkbox"/>             | <input type="checkbox"/>    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>     |

## Working Well Fitness Measurements

### Blood Pressure

Systolic: \_\_\_\_\_ / \_\_\_\_\_ Diastolic

*Nutrition Assessment Lab Staff Only*

☐ WNL ☐ High ☐ Low

### Body Composition

Height: \_\_\_\_\_

Weight: \_\_\_\_\_

BMI: \_\_\_\_\_

Total Body Fat: \_\_\_\_\_ %

☐ Underweight  
☐ Normal  
☐ Overweight  
☐ Obese  
☐ Secondary

☐ WNL ☐ High ☐ Low

### Bone Density

T-Score: \_\_\_\_\_

Z-Score: \_\_\_\_\_

☐ WNL  
☐ Osteopenia  
☐ Osteoporotic

### Lipids

Total Cholesterol: \_\_\_\_\_ mg/dL

HDL Cholesterol: \_\_\_\_\_ mg/dL

Triglycerides: \_\_\_\_\_ mg/dL

LDL: \_\_\_\_\_ mg/dL

TC/HDL Ratio: \_\_\_\_\_

☐ WNL ☐ High ☐ Low

☐ WNL ☐ High ☐ Low

☐ WNL ☐ High ☐ Low

☐ WNL ☐ High ☐ Low

☐ ≤ 3.5 ☐ > 3.5

### Serum Levels

Glucose: \_\_\_\_\_ mg/dL

☐ FBG ☐ PP \_\_\_\_\_ hrs

☐ WNL ☐ High ☐ Low

Resting Metabolic Rate: \_\_\_\_\_ kcals

### Nutrient Profile

Energy: \_\_\_\_\_ kcals

Fat: \_\_\_\_\_ gm SFA: \_\_\_\_\_ gm

Fiber: \_\_\_\_\_ mg Sodium: \_\_\_\_\_ mg

A: \_\_\_\_\_ mcg RAE C: \_\_\_\_\_ mg

Calcium: \_\_\_\_\_ mg Iron: \_\_\_\_\_ mg

☐ 5 - 9 svgs fruits/vegetables  
☐ 2 + svgs of fish/week  
☐ 2 - 3 svgs calcium rich foods  
☐ 3+ svgs whole grain foods  
☐ 0 - 1 svgs fried foods  
☐ 0 - 1 svgs sweet foods



| WORKSITE + WELLNESS   |                    |                    |
|---|--------------------|--------------------|
| <h2>Nutrition Assessment Laboratory</h2> <h3>Working Well Enrollment Form</h3>  |                    |                    |
| <p>The Ball State University Nutrition Assessment Laboratory conducts several forms of nutrition assessments, including anthropometric, clinical, dietary, and biochemical assessments. Most screenings are non-invasive, resulting in minimal risk to patients (e.g., fingerstick for biochemical analysis will require a skin puncture and removal of a small quantity of blood; as with any skin puncture, the risk to the patient may include minor bruising, bleeding, or infection at the puncture site). All universal precautions are practiced in the Nutrition Assessment Laboratory for the safety of patients and employees.</p>  |                    |                    |
| <p>The purpose of the Nutrition Assessment Laboratory is to help BSU faculty and staff take positive steps to improve their health, such as eating healthier, becoming more physically fit, and reducing any risk factors associated with chronic diseases such as diabetes, obesity, osteoporosis, and heart disease. To achieve this objective, information collected about you through your responses to surveys, questionnaires, and assessments will be maintained by the nutrition assessment lab.</p>  |                    |                    |
| <p>All information you provide will be kept completely confidential. Your information will help us plan future activities and will provide us with data to measure the impact of the lab as we try to help you identify and attain your health-related goals. The Nutrition Assessment Lab reserves the right to email you about upcoming events, appointment reminders, and health education messages to your preferred email address.</p>   |                    |                    |
| <p>Your participation in this lab is voluntary. It should NOT be used as a substitute for professional medical advice, diagnosis, or treatment. The Nutrition Assessment Lab will provide you with a copy of your results so that you may share them with your primary care physician. To ensure your privacy, the Nutrition Assessment Laboratory staff will not release your personal information directly to a third party.</p>  |                    |                    |
| <p>It is understood that, in the unlikely event of physical injury resulting from any procedure completed in the Nutrition Assessment Lab, Ball State University (BSU), its agents and employees, will assume whatever responsibility is required by law. If you have any questions about your rights as a participant in this laboratory, please contact Ms. Melanie Morris, Coordinator of Research Compliance, Office of Academic Research and Sponsored Programs, BSU, Muncie, IN 47306, (765) 285-5070. Additional questions can be directed to Dr. Carol Friesen, Nutrition Assessment Lab Coordinator, at (765) 285-5925.</p>  |                    |                    |
| <p>.....</p>  |                    |                    |
| <p>I, _____, have reviewed the above information and I agree to participate in this Nutrition Assessment program. The objectives of the Nutrition Assessment Laboratory have been explained to me; any questions I had about the testing measurements used to evaluate my health have been answered to my satisfaction. I give my consent to participate and to share my results with the all Nutrition Assessment Laboratory staff. I understand my medical information may be used in a confidential manner to conduct program evaluation and research activities. My name, however, will NEVER be used in any publication, document, or report without my prior written consent.</p> |                    |                    |
| Participant's Signature _____   | Today's Date _____ | Phone Number _____ |
| <input type="checkbox"/> If my results are out of acceptable range, I would like a follow-up call from the QuickClinic nurse practitioner.  |                    |                    |

## Working Well Nutrition Assessment Enrollment Form

Name: \_\_\_\_\_ Birthdate: \_\_\_\_/\_\_\_\_/\_\_\_\_ Today's Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

Work Address: \_\_\_\_\_ Preferred Email Address: \_\_\_\_\_

Gender: ☐ Male ☐ Female Race: ☐ White ☐ Black ☐ Asian ☐ Hispanic ☐ Other

### About the Nutrition Assessment Laboratory...

1. I came to the Nutrition Assessment Lab because I want to (check all that apply):

- |   |   |
|---|---|
| <input type="checkbox"/> Lose weight                      | <input type="checkbox"/> Help my blood pressure             |
| <input type="checkbox"/> Lower my cholesterol             | <input type="checkbox"/> Help my diabetes                   |
| <input type="checkbox"/> Help my back, legs, joints, etc. | <input type="checkbox"/> Help my heart condition            |
| <input type="checkbox"/> Have more energy                 | <input type="checkbox"/> Help prevent osteoporosis          |
| <input type="checkbox"/> Start a diet/exercise routine    | <input type="checkbox"/> Improve my overall diet            |
| <input type="checkbox"/> Learn more about diet/exercise   | <input type="checkbox"/> Identify health risks I might have |
| <input type="checkbox"/> Other: _____                     |   |

2. What programs would you like to Nutrition Lab to offer?

- |   |   |
|---|---|
| <input type="checkbox"/> Healthy Cooking Demonstrations | <input type="checkbox"/> Healthy Eating Discussions |
| <input type="checkbox"/> Supermarket Tours              | <input type="checkbox"/> Weight Loss Competitions   |
| <input type="checkbox"/> Menu Planning Advice           | <input type="checkbox"/> Other: _____               |

### About My Health Habits and Conditions...

3. In a typical week, I take part in physical activity \_\_\_\_ days/week. (Examples: walking, gardening, dancing, jogging, bike riding, or anything that makes your heart beat faster).

- |  |                                   |
|--|-----------------------------------|
| <input type="checkbox"/> None (Skip to Question 6) | <input type="checkbox"/> 3-4 days |
| <input type="checkbox"/> 1-2 days                  | <input type="checkbox"/> 5-7 days |

4. On days when I take part in physical activity, I usually spend \_\_\_\_\_ minutes in this activity.

5. I typically consume alcoholic beverages.

- ☐ Never  
☐ Rarely (1 time per month or less)  
☐ Weekly  
☐ Daily

6. I smoke cigarettes, cigars, or chew smokeless tobacco.

- ☐ Never ☐ Used to; I quit ☐ Yes, \_\_\_\_\_ times/day

7. My health conditions are:

- |  |   |
|--|---|
| <input type="checkbox"/> Diabetes            | <input type="checkbox"/> Pre-diabetes               |
| <input type="checkbox"/> High Blood Pressure | <input type="checkbox"/> Pre-hypertension           |
| <input type="checkbox"/> High cholesterol    | <input type="checkbox"/> Osteopenia or Osteoporosis |
| <input type="checkbox"/> High triglycerides  |   |
| <input type="checkbox"/> Other: _____        |   |

8. In the past few months I have had:

- ☐ Lost weight on purpose  
☐ Lost weight not on purpose  
☐ Stayed at my current weight  
☐ Gained weight

9. I think my overall health is:

- |                                    |                                    |
|------------------------------------|------------------------------------|
| <input type="checkbox"/> Very good | <input type="checkbox"/> Poor      |
| <input type="checkbox"/> Good      | <input type="checkbox"/> Very Poor |
| <input type="checkbox"/> Fair      |                                    |



**Working Well Fitness Measurements****Blood Pressure**

Systolic: \_\_\_\_\_ / \_\_\_\_\_ Diastolic

*Nutrition Assessment Lab Staff Only*
☐ WNL    ☐ High    ☐ Low
**Body Composition**

Height: \_\_\_\_\_

Weight: \_\_\_\_\_

BMI: \_\_\_\_\_

Total Body Fat: \_\_\_\_\_ %

Waist Measurement: \_\_\_\_\_ inches

☐ Underweight  
☐ Normal  
☐ Overweight  
☐ Obese  
☐ Secondary

☐ WNL    ☐ High    ☐ Low

☐ WNL    ☐ High    ☐ Low
**Bone Density**

T-Score: \_\_\_\_\_

Z-Score: \_\_\_\_\_

☐ WNL  
☐ Osteopenia  
☐ Osteoporotic
**Lipids**

Total Cholesterol: \_\_\_\_\_ mg/dL

HDL Cholesterol: \_\_\_\_\_ mg/dL

Triglycerides: \_\_\_\_\_ mg/dL

Calculated LDL: \_\_\_\_\_ mg/dL

LDL to HDL: \_\_\_\_\_

☐ WNL    ☐ High    ☐ Low

☐ WNL    ☐ High    ☐ Low

☐ WNL    ☐ High    ☐ Low

☐ WNL    ☐ High    ☐ Low

☐ ≤ 3.5    ☐ > 3.5
**Serum Levels**

Glucose: \_\_\_\_\_ mg/dL

Hemoglobin A1-c: \_\_\_\_\_

Hemoglobin: \_\_\_\_\_ mg/dL

☐ FBG    ☐ PP \_\_\_\_\_ hrs

☐ WNL    ☐ High    ☐ Low

☐ WNL    ☐ High    ☐ Low

Resting Metabolic Rate: \_\_\_\_\_ kcals

**Nutrient Profile**

Energy: \_\_\_\_\_ kcals

Fat: \_\_\_\_\_ gm    SFA: \_\_\_\_\_ gm

Fiber: \_\_\_\_\_ mg    Sodium: \_\_\_\_\_ mg

A: \_\_\_\_\_ mcg RAE    C: \_\_\_\_\_ mg

Calcium: \_\_\_\_\_ mg    Iron: \_\_\_\_\_ mg

☐ 5 - 9 svgs fruits/vegetables  
☐ 2 + svgs of fish/week  
☐ 2 - 3 svgs calcium rich foods  
☐ 3+ svgs whole grain foods  
☐ 0 - 1 svgs fried foods  
☐ 0 - 1 svgs sweet foods

1/9/2008

## APPENDIX C

### LETTERS OF PERMISSION AND CONSENT

C-1 Letter of Consent

C-2 Letter of Permission

**WORKSITE**

**+**

**WELLNESS**

## **Nutrition Assessment Laboratory** ***Working Well* Enrollment Form**

The Ball State University Nutrition Assessment Laboratory conducts several forms of nutrition assessments, including anthropometric, clinical, dietary, and biochemical assessments. Most screenings are non-invasive, resulting in minimal risk to patients (e.g., fingerstick for biochemical analysis will require a skin puncture and removal of a small quantity of blood; as with any skin puncture, the risk to the patient may include minor bruising, bleeding, or infection at the puncture site). All universal precautions are practiced in the Nutrition Assessment Laboratory for the safety of patients and employees.

The purpose of the Nutrition Assessment Laboratory is to help BSU faculty staff, and students take positive steps to improve their health, such as eating healthier, becoming more physically fit, and reducing any risk factors associated with chronic diseases such as diabetes, obesity, osteoporosis, and heart disease. To achieve this objective, information collected about you through your responses to surveys, questionnaires, and assessments will be maintained by the nutrition assessment lab.

All information you provide will be kept confidential. Your information will help us plan future activities and will provide us with data to measure the impact of the lab as we try to help you identify and attain your health-related goals. The Nutrition Assessment Lab reserves the right to email you about upcoming events, appointment reminders, and health education messages to your preferred email address.

Your participation in this lab is voluntary. It should NOT be used as a substitute for professional medical advice, diagnosis, or treatment. The Nutrition Assessment Lab will provide you with a copy of your results so that you may share them with your primary care physician. To ensure your privacy, the Nutrition Assessment Laboratory staff will not release your personal information directly to a third party.

If you have any questions about your rights as a participant in this laboratory, please contact the Office of Research Integrity, BSU, Muncie, IN 47306, (765) 285-5070. Additional questions can be directed to Dr. Carol Friesen, Nutrition Assessment Lab Coordinator, at (765) 285-5925.

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I, \_\_\_\_\_, have reviewed the above information and I agree to participate in this Nutrition Assessment program. The objectives of the Nutrition Assessment Laboratory have been explained to me; any questions I had about the testing measurements used to evaluate my health have been answered to my satisfaction. I give my consent to participate and to share my results with the all Nutrition Assessment Laboratory staff. I understand my medical information may be used in a confidential manner to conduct assessments, conduct program evaluation, and conduct research activities. My name, however, will NEVER be used in any publication, document, or report without my prior written consent.

\_\_\_\_\_  
Participant's Signature

\_\_\_\_\_  
Today's Date

\_\_\_\_\_  
Phone Number

☐ If my results are OUT of acceptable range, I would like a follow-up call from the QuickClinic nurse practitioner.

## Appendix C – 2 – Letter of Permission to Conduct Study



August 3, 2016

Dear Ms. Vukovich,

Thank you for your assistance with the Nutrition Assessment Lab. I am pleased to give you permission to analyze the existing data collected from the NAL Enrollment Forms to conduct your study.



Rhonda Murr

Director of Health Enhancement